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EDITORIAL NOTES.

Under Full Control—War and Statutory Regulations.

THE gas industry used to chafe under the excessive statutory restrictions which hampered its progress, and hindered it in moulding its policy and methods to the conditions which time and fresh discovery brought about. Then, largely through the work of the late Sir George Livesey and the South Metropolitan Company (to which work the present Chairman, Mr. Charles Carpenter, D.Sc., materially contributed), a greater measure of freedom was obtained, and that condition was the one that was being enjoyed at the time the hostilities began which have inverted and dislocated the whole of the world's affairs. With the war, it has been found that the statutory regulations, the supervening war conditions, and the activity of war-profit makers, have combined to fix progressively a most unreasonably heavy weight upon the heels of the industry—mostly financial—which interferes with its mobility and opportunities in doing the best possible to resist the oppression which war conditions of an inevitable sort would alone impose.

The industry has never been under so much impediment and control as at the present time; and while it has to put up with it, it does not like the position, although in so far as the conditions are the best for the country as a whole, no complaint is made. Taking the address of the Chairman at the meeting of the South Metropolitan Gas Company last Wednesday, and picking from it the points that affect the current situation, a general indication is presented without the details as to actual effect, of the nature of the impediments and control currently ruling the industry. There are the coal difficulties and high prices; but the Chairman in these respects now feels much more comfortable over them than he did before the Coal Exports Committee (the death of whose Chairman, the Right Hon. Russell Rea, M.P., we exceedingly regret) set to work, and the Price of Coal Limitation Act came into force. Then there are freights, in connection with which the Chairman does not see any signs of improvement, and he has not a good word to say for the Government as to the way in which they have handled this matter—in fact, their policy in regard to it has been "very disturbing," which, when the infinite consequences are considered, is a modest way of expressing the position. There has been a great deal of mystery over the inaction of the Government in regard to freights; and when Mr. Carpenter says that he cannot understand why they have not before this controlled transport by sea as well as by land, he is only saying what business men throughout the country are feeling and remarking—men who know how much the country has been industrially and commercially crippled by the disinclination of the Government to attack the problem of the mercantile shipping before this reached the chaotic and acute situation in which it is now, and rescue from which will be a much more difficult matter than it would have been formerly. Incidentally in this connection, the information was given, in reply to a question by a proprietor, that the Company are having five colliers built, and have been running some old ones which they acquired in order to obtain some relief from the excessive market rates of freight.

The extraordinary conditions in regard to coal and freight are the worst of the trammels; but they are not the sum of them. Restrictions have been placed by the Government upon the export of coke. There is no complaint as to this, so long as the coke is really required for home use; but, of course, the limitation of the market affects local prices and limits distribution. High freights, again, have embarrassed the industry through depriving it of its foreign market for pitch; and the annexing of the Road Board's finances (there is to be partial restoration of their contributions for road-tarring purposes) has also helped to depress the tar market. And now the Government have stopped the issue of licences for the export of sulphate of ammonia; although the producers, through their Association, were willing to reserve sufficient for home use at a relatively low price. There are labour difficulties owing to the war; the higher price of gas is a drag on normal, let alone obstructing an increase of, business; and the rightly imposed lighting restrictions are not conducive to the promotion of the best of trading circumstances. Thus, as is seen, in every direction gas undertakings are controlled or impeded in connection with their operations at a time when the largest amount of trading freedom is required to make both ends meet. All the control and all the impediments have their combined effects, measured by the increase in the price of gas, the reduction of dividend (as well as bonuses in employee co-partner companies), and in some cases the diminution of the moneys in reserve.

Speaking of the reduction of the dividend, the point was raised in our columns some time ago (and has since been referred to) as to the sliding-scale not having any provision embodied in it for extraordinary circumstances, in order to obviate excessive depreciation of dividend and market values of stock, and reduce gas companies to a worse capital-raising position than other enterprises. We are pleased to see that, in effect, Mr. Carpenter acknowledges the deficiency of the sliding-scale system in this one respect. He says: "The constitution of the Company, if I may so describe the "Acts of Parliament under which we work, was never "framed to meet war times; and there is no doubt, in my "mind, that the dividend payable does not represent an "adequate return for the risks and difficulties inseparable "from carrying on a business of this particular complexity "and magnitude, and which increase rather than diminish—"in other words, that the sliding-scale is not giving even "justice at the present juncture." This statement will also be a satisfaction to those gas men—coming as it does from the (so to speak) birthplace of the sliding-scale—who have recently been trying to move in the matter of making an effort to obtain the suspension of the sliding-scale during the war, to the extent that war conditions affect its normal operation. While sympathizing with them, we are in full agreement with Mr. Carpenter, in view of the resolve of the Government not to take up any legislative matters that can be postponed, that it is at present no use quarrelling with the position, "as certainly no remedy is possible during the "continuance of the present struggle, and we must be con-"tent to make the best of it." The form of this statement suggests that the matter will not be overlooked on some future occasion. But the Chairman proceeded to apply a little emollient by asking the proprietors, when considering how much the dividend has fallen, to remember that the consumers are also suffering by reason of the increased price charged for gas, and the employees by reason of the diminished bonus earned under the co-partnership. "The "burden has, at any rate, been shared." "Shared;" but "the sliding-scale," said the Chairman just previously, "is "not giving even justice at the present juncture." There is certainly in the current circumstances inequality in the "sharing" process regarded from the point of view of the individual proprietor and the individual consumer. The burden of the increase made in the price of gas is spread to a greater extent than the reduction of dividend. The proprietor who depends for his income upon the dividends received from his investments in gas is hit much harder than the individual consumer, especially when we consider the weight of income-tax. We do not expect, if this war ends in the manner we all hope it will do, that there will be a repetition of war on a similar colossal scale for generations, if ever. But what of amalgamations for militant purposes of powerful trade unions? What extraordinary internal troubles are we likely to have in the future? Possibilities must be considered; and we do not want gas stocks and shares to lose, under altered circumstances, their

old reputation for a fair consistency of value, and for assurance as to dividends. What possible harm could be done by conferring on the Board of Trade the power to suspend the operation of the sliding-scale in respect of dividends under an exceptional set of conditions that could not fairly be said to have been in contemplation when the sliding-scale system was framed? The existence of such a power could not possibly harm anybody; but it would be an available standing protection.

A large part of the proceedings on Wednesday was taken up with the consideration of the Bill the Company are promoting for causing their financial powers to harmonize with the needs of the times. The times have changed, and so have the standards of investment, and the requirements of investors. The terms on which gas capital issues were made in the past are no longer applicable; and the inapplicability has been consolidated and accentuated by the general financial conditions created by the war. These conditions are not of an ephemeral character; they will have long continuance. But the possession of powers to issue redeemable stocks bearing high rates of interest is a protection against their existence in perpetuity, if conditions recede in manner that will allow capital to be issued upon easier terms.

Reasonableness and Air Raids.

Meddlers with things about which they know little or nothing were, during the weeks when the peace of these islands was undisturbed by nocturnal air raids, urging that, where lighting restrictions were in force, they should be relaxed. There was no ground whatever for their officious intervention. The protection of the whole community from the bombs of the German dastards was a matter that they obviously considered of minor importance to the safety of those relatively few pedestrians and wayfarers who now use the streets after nightfall. These are stay-at-home times after dark; for the attractions of the outer life have been depreciated considerably by the curtailment of the public lighting. But the vapourings of the busybodies had, and very properly, no effect upon the authorities; and the busybodies have had a salutary lesson offered to them by the experiences in the murderous raid in the Midlands and Eastern and North-Eastern counties. On this occasion it was proved conclusively that towns that were the darkest (though lying right under the track of one or other of the Zeppelins) were the safest, and escaped with little or no harm; those where the lighting had not been, or had been only slightly, dimmed—not being within an area in which the lighting restrictions were in force—suffered terribly in some cases, both by the slaughter of human beings and the destruction of property. The evidence as to this was so pronounced that there is nothing more to be said against restriction; and, in face of the terrible lessons of the raid, the local authorities and the people in the areas affected, hardly required the belated order of the Home Office extending the restrictions as to street, shop, factory, and domestic lighting to the central and north-western areas of England. Before the order was issued, many of the local authorities had already decided upon, and the residents had clamoured for, that night darkness which mystifies the cowards of the air, and defeats them in their efforts to obtain the desired measure of satisfaction from their brutal work.

But a feature of the last air raid is that it enlarges the accumulation of evidence as to the proficiency of the central authorities (to whom the country looks for foresight in this matter of protection) in becoming wide awake, after life has been lost and property has been laid to waste, to the fact that something more should have been done than has been done. The range of the Zeppelin has been known for some time; but instead of this range being taken into account, the authorities seem to have based the scope of the application of their regulations upon actual performance rather than upon capacity and possibility. So, perhaps, when the Zeppelins pass beyond the extended area to which the lighting restrictions have now been applied, authority will make another enlargement of the area. But it seems to be a condition precedent to effective steps being taken that grave mischief must be done. This applies in this matter, though very definite is the lesson of the last raid that the darkest towns are the safest. It will, however, be a pity if the local authorities adopt panic measures. There is no need to be unreasonable; but this is what the local governors of some towns decidedly are in connection with the doing of what is necessary in respect of precautions and of laying down rules as to how to act when the warning is given that Zeppelins are approaching. We are prohibited from publishing the names of towns. But there is at least one local authority who have determined since the great raid to cease altogether the lighting of the public streets. That is wrong. In other cases, it is reported, instructions have been given that, on information arriving as to the approach of air raiders, the supplies of both gas and electricity are to be cut off. This is dangerous, especially in connection with indoor lighting. Perhaps, under the new conditions of airships having become a portion of the equipment in military organization, and their use of military importance, save when employed in the hellish business of slaughtering innocent people, including women and children, it may in time become to be regarded as a military necessity that the public gas-lamps shall, in some way, have a special system to themselves, or shall be under pressure-wave or other form of control which will enable the lamps to be extinguished at a given signal, and lighted again when danger has passed.

It is not only lighting that requires to be suppressed, but church bells and chimes, works' syrens, &c. This is being done in some cases. Sound can be a guide as well as light. But we see it has been decided in more than one extensive area to use large electric-buzzers to give warning of the approach of aërial raiders. The use of electric-buzzers is all right so long as they are not employed in a way, and at a time, that will enable the raiders to gain information as to their precise location. The enemy is in our midst; and there is no question that information as to the precautions adopted, and particulars that may be of value to the raiders, find their way by, it may be, devious routes to the place from which the raids are planned.

However, our interest is chiefly centred in the precaution as to lighting; and in this respect, although restriction of lighting means reduced gas consumption, all in the industry are to-day confirmed in the view that, under the modern conditions of warfare, darkness and not light is an imperative night condition of the streets of cities, towns, and villages. But regulation need not be carried to the extreme of unreasonableness. In saying this, we shall have those who like mathematical accuracy asking us: "What is "reasonable and what is unreasonable in this matter?" They would probably like the reply expressed in foot-candles; but the only reply we are inclined to give them, and consider necessary, is that in every city, town, or other place, commonsense must be the referee and arbitrator.

The Treasury and Tar for Road Purposes.

It cannot be said that, since gas undertakings have been busy on the extraction of benzol and toluol from gas by the "C" process, they have received much encouragement from the Government; as a matter of fact, tar commercially has gone from bad to worse. Pitch has become a drug on the market, and stocks are accumulating in an embarrassing manner; and this all through freights being at rates that are prohibitive to the export of pitch. On top of this, road authorities have been economizing in their use of tar for road surfacing and making purposes; and, in the early part of last year, the Road Board began to retrench in the matter of grants for this purpose. Following, there came the announcement that the Government were going to divert—only temporarily, we believe—the current funds of the Road Board into service in directions that were, through the war, immediately pressing. This meant a further discouragement to road authorities to make good use of tar for road maintenance, without saying anything as to its employment for permanent improvement purposes.

Yet gas undertakings were faced with this position: Toluol and other constituents of tar were wanted badly and in greater and greater quantities by the Government; to obtain the largest practicable yield of toluol, the largest possible quantity of gas must be consumed. The more gas consumed, the greater the quantity of tar and pitch made; and, under the repressive conditions produced by inaction as to freights and the want of encouragement to local authorities to employ tar for road purposes, the worse off the gas undertakings in regard to this product. Furthermore, the Ministry of Munitions—quite properly—prohibited the use of crude tar on the roads; and the Road Board supported them in this. Then gas undertakings have largely adopted tar-dehydration plants, for the double purpose of facilitating

and rapidly enlarging the available yield of the products the Government desire for high-explosive purposes, and of complying with the behest of the authorities as to only refined tar being used on the roads. The stock of the dehydrated tar has been increasing throughout the country; and tar distillers are not particularly solicitous about taking the partly distilled tar while they are well supplied with the crude material. And, as a matter of fact, too, some works are finding a little trouble with the tar through, after dehydration, its greater viscosity, which makes barging and emptying much more troublesome.

And in face of all this, tar is not just now a particularly good friend in respect of the fortunes of gas undertakings. In the accounts of many undertakings last year, it did not show up at all well; and the prospects were worse. However, according to a report issued last week by the Council of the Institution of Gas Engineers, the Treasury have now agreed that "a sum equal to that expended in the past year "should be devoted to the repairs of roads during 1916." The gas industry is truly thankful for small mercies; but it would be more so for yet larger consideration under the pressing circumstances. The "past year," as we have pointed out, was not one of the best for the amount of work done on the roads—in fact, it falls a long way behind the best. What the gas industry thinks would be only fair under current conditions would be that the road authorities should be encouraged to use tar up to their requirements in one of the best years, and not be limited to those of one of the leanest years—such as was the "past year."

Calorific Standards in England and America.

We have much pleasure in publishing to-day a letter from Mr. S. W. Stratton, Director of the Bureau of Standards at Washington, and may express the hope that a large number of engineers will comply with our correspondent's request for certain information regarding the fixing of calorific value standards. It will have been observed from articles that have appeared in our columns that the controlling authorities in America have had a decided leaning towards higher calorific standards than obtain in this country, while generally, though not entirely, the technical advisers of the gas companies have had a tendency towards fixing standards that approach somewhat nearer that which has been prescribed as the standard in this country, subject to any modification deemed desirable owing to local conditions. We agree with our correspondent that the problem of the selection of the proper heating value standard is primarily an economic one; and, further, that the question is to determine the amount of "useful heat" which can be made available for a given price to the consumer. We are glad to see this employment of the word "useful;" for if the mind is kept upon this term, and not upon the mere question of the quantity of B.Th.U. per cubic foot (which is subsidiary to giving the consumer something that will be most useful to him for the variety of work for which he wishes to use the gas), much light is thrown upon the problem.

This brings us to the point at which we could have wished that Mr. Stratton had entered upon a little explanation, and shown us what he personally means by "useful" heat. The amount of the "useful" heat, of course, depends (always assuming consumption to be with the most efficient appliances) upon the composition of the gas, and the quantity and intermixing of the air required for its combustion. For water heating the value of a gas may be said to be directly according to its calorific power; but for incandescent lighting it is not so. For this purpose, or any other requiring a high temperature, a gas is needed the composition of which will enable the most intimate admixture to be made between it and the air, so as to get the most perfect combustion, and the highest flame temperature possible, and this without introducing to the gas more air than is requisite, so as not to swell the volume of nitrogen, carbonic acid, and water vapour, which do not assist flame temperature, but extract heat from the flame, and carry it off in the products of combustion. The intensity of the flame itself, and not the calorific value of the gas, is the thing that matters for lighting or other purposes needing a high flame temperature. For power purposes, too, the character of the gas that will allow of the most speedy and intimate admixture with air is the most serviceable. Ethylene, propylene, and benzene are the three components of coal gas of *per se* the highest calorific value; but they are the three that require the largest quantity of air for their combustion, in comparison with the other constituents of the gas, and the more air demanded for the complete combustion of such gases, the more nitrogen, carbonic acid, and water vapour will there be trotting off through the medium of the products of combustion, with heat energy from the flame. The gases that demand the least amount of air for their perfect combustion are hydrogen and carbon monoxide, and next methane. Yet the differences between the calorific values of these gases mixed with the relatively small quantity of air needed for complete combustion and of the gases of higher individual calorific power mixed with the larger amount of air needed for their complete combustion, are very small indeed. It is significant—and this bears upon the general question—that the removal of benzol from (say) 16-candle gas to an extent which will reduce the illuminating power to about 10½ candles will only affect the calorific power by between 4 and 5 per cent. Therefore it is clear that, to obtain the best results by realizing the most intimate admixture, and by keeping to as low a level as possible the quantity of air in the mixture, and so reducing the volume of the heat-absorbing products of combustion, a rich gas cannot be the most "useful" for the consumer.

It seems that Mr. Stratton regards as a "very low" heating value the calorific standard adopted in this country—500 B.Th.U. (total heat test); and he asks whether this operates to the advantage of the consumer, or would the consumer and the gas undertaking be better cared for if the calorific quality were increased (say) by 5 or 10 per cent., with a corresponding increase in the price charged for gas. Taking into consideration the conditions of consumption and use, our reply to the first part of the question is in the affirmative; and we cannot see any compensating advantage in raising the standard. In another form, Mr. Stratton puts the position positively to the "best informed engineers" in this country. He asks: "Would you prefer to deliver "gas of (say)5 or 10 per cent. greater heating value per "cubic foot, if you could secure for such gas an increase in "price of 5 to 10 per cent.?" The answer to this is that some of the best informed engineers in this country formerly asked Parliament for a standard of 540 B.Th.U. gross with a 7½ per cent. margin before penalties began to accrue, and latterly have been preferring a level 500 B.Th.U. standard, without the margin. Had they a preference in the direction indicated by our correspondent, they would put it into operation in their applications to Parliament. If, too, a manager considered it better for his undertaking and consumers that he should give 10 per cent. more B.Th.U. than the standard, there is nothing whatever to prevent him doing so. He can give any calorific value he likes above the standard; but he knows that it is prudent to keep the quality fairly regular. As to 10 per cent. increase in the price charged, municipal gas undertakings and maximum price companies can sell at what figure they like up to their statutorily prescribed maximum, which is always well ahead of their requirements. Sliding-scale companies, too, can increase their price (if necessary), providing they reduce their dividend. So that, if it were to the interests of consumers and undertaking, any gas management has complete liberty to augment the calorific power of the gas distributed, and, if conditions demand, advance the price at the same time. But let us look at actual figures. In normal times a very large part of the gas in this country is sold at 2s. 6d. and under per 1000 cubic feet, or (taking the bare 500 B.Th.U. standard) per 500,000 B.Th.U., or 16,666 B.Th.U. for 1d. Supposing the calorific value is increased by 10 per cent., 50,000 B.Th.U. would be added to the total. Increasing 2s. 6d. by 10 per cent. would give another 3d. Divide the 50,000 B.Th.U. by 3d., and we have still 16,666 for 1d. Supposing that 4s. 2d. is charged for 1000 cubic feet of 600 B.Th.U. gas—that is a total of 600,000 B.Th.U., or 12,000 B.Th.U. for 1d. Ten per cent. added to the 600,000 B.Th.U. would be 60,000 B.Th.U. Ten per cent. added to the 4s. 2d. would be 5d. Divide the 60,000 by five, and we have still 12,000 B.Th.U. for 1d. We fail to see where the consumer or the undertaking would, from the economic standpoint, be benefited by the additions.

We are pleased to see that the Bureau of Standards is perfectly willing to advocate a lower heating value standard than that which now prevails in the United States, "if "thereby better service to users of gas can be ensured." Investigations this side all go to show that gas of approximately 500 B.Th.U. is a gas that has good all-round usefulness for the consumers, and that, considering the variety of purposes to which it is put, there would not be, for the

various reasons advanced, any economic gain to the consumers by adopting higher values. A somewhat higher value than the standard must, of course, always be supplied, in order to ensure continuous compliance, and to escape the infliction of penalties. We repeat the hope that some of our British gas engineers and chemists will comply, through the "JOURNAL," with Mr. Stratton's request for their views on the points he raises.

The Third Largest London Company.

In view of the fact that the Brentford Gas Company have recently successfully carried through amalgamations which must have had the effect of largely increasing the list of shareholders, as well as the area over which powers extend for the supply of gas, it is not surprising that last week's meeting should have been unusually well attended. The undertaking is an increasingly important one; for its latest activities have resulted, as the Chairman (Mr. R. J. Neville Neville, M.P.) pointed out, in the Brentford becoming "the third largest Company in the London area—their output coming above that of the Commercial Gas Company, and next to that of the South Metropolitan Company." And apart from these considerations, some of the proprietors may have been moved to attend the meeting by a desire to make the most of their opportunities; they having seen in the Directors' report a proposal that in future there should be only one general meeting each year, instead of the two hitherto held. This course was shown by the Chairman to possess several advantages, which were evidently thoroughly appreciated by all those present, none of whom offered the slightest opposition to the suggestion. If the proprietors do have to wait for twelve months before the Board next render an account of their stewardship, a perusal of last week's proceedings will convince them that they can do so without feeling anxiety. The small increase made in the price of gas—the first upward move for nearly a quarter-of-a-century and, referring to the rises of the Metropolitan Companies, "longer delayed than the others"—it is hoped will see the Company through the present troublous times; and the accounts reveal a first-rate position of affairs. In the past half year the additional cost of coal has been practically balanced by the extra receipts; while the heavy sum required to meet the allowances made to those on active service and for war bonus, has been secured by savings under the head of distribution. These are gratifying features; and alluding to them calls to mind the excellent record of the Company—which deservedly was the subject of a special resolution at the meeting—from a patriotic standpoint. No less than 45 per cent. of the employees have joined the Colours or been attested for service when required—which affords ample justification of a feeling of pride on the part of all concerned.

Coal and Coke District Committees.

Such a multiplicity of Committees have been called into being by the war, and through the unusual conditions to which birth has been given by it, that the outsider will have some difficulty in keeping within mind the number of such bodies who are looking, with more or less efficiency, after his and the country's interests in this time of trial and crisis. It is obvious that some of the Committees, through the immensity of the matters with which they have to deal, have to act on incomplete information; and there is consequently a fair amount of speculation underlying their decisions. If the decisions are right, so much the better; if they are wrong, there is a shrug of the shoulders, and the best possible, it is said, has been done under the circumstances, and with the knowledge available. In dealing with coal and coke, or (to use the generic term) the fuel supply question, the Board of Trade have brought into existence eleven District Coal and Coke Supplies Committees, who are to act as intelligence collectors and fuel controllers, with reference of questions beyond their functions to a Central Committee, of which Mr. W. F. Marwood, C.B., is Chairman, and whose duty it is to consider matters relating to the distribution of coal and coke. The appointment of the District Committees has been very favourably received; for it is recognized that the question of fuel supplies is more pressing in some districts than in others. They are to ascertain and keep an account of the resources of their respective districts, and see firstly that these resources are utilized to the best advantage for the requirements of important industries, especially those engaged on munition work. Gas-works and coke-oven plants, as the sources of the supply of certain high explosives, must be among the first to have consideration. Careful attention, too, will be given to any recommendation the Committees may make with the view of realizing greater economy in the use of coal. If their work is carried on in a broad and circumspect manner, the Committees should be very helpful at this time.

Distribution—by Rail and Sea.

Regarding the matter of coal and coke distribution, the Ministry of Munitions have issued a circular-letter urging upon all users the more economical employment of railway trucks, by prompt unloading and return. The waggon pooling scheme is being actively investigated by the Railway Executive Committee; but their views as to the pooling of privately owned waggons are not yet known. Voluntarily, the Great Eastern, Great Central, and Great Northern Railway Companies have come to an agreement regarding the pooling of their waggons, in the hope that this will be of public advantage. The question of freights is also occupying a large amount of attention, and will probably do so this week in prominent ways—business men being very dissatisfied with the methods pursued by the Government in the handling of this matter. Lord Curzon's Committee are busily engaged in assessing the number of ships which can be spared from the primary duties of supplying the direct military requirements of the Governments of this and allied countries. Italy particularly is in need of succour in the shape of cheaper tonnage. But, speaking generally, there is a large amount of secrecy as to what the Government are doing in connection with organizing the mercantile marine, and bringing freight rates down to a more reasonable level. Only the other day the Executive of the Unionist Business Men's Committee of the House of Commons had an interview with the President of the Board of Trade respecting the problems arising out of the control of shipping; but they appear to have been placed under a pledge of secrecy as to what Mr. Runciman had to say on that occasion. The shipowners seem to be, reluctantly, making a little concession to the pressure of public opinion. But it is a very little—that hoary headed old sinner the law of supply and demand continuing to be put forward as a satisfactory excuse for the shipowners' remarkably profitable terms. The current rates for coal from the Tyne to London are from 14s. to 15s. per ton. Why not 11½s. or 11½s. per ton? Or, why not, in the interests of the country, 5s., 6s., 7s., or at most 7s. 6d. per ton, when the Gas Light and Coke Company can bring with their own vessels coal from the Tyne and from Yorkshire at prices (items of expense all told) between a few pence below or above 4s. per ton? The shipowners, however, prefer two to three times more than there is any occasion to charge, so that there will be a good balance of profit for them, after satisfying the 50 per cent. excess profit tax.

The Oil Position.

While the outlook for coal is not, with all the schemes adopted to ease the situation, such a happy one as large users could wish, the oil position is not any better, what with the reduction of imports and the price. Some large producers of carburetted water gas will be very tightly pressed soon if oil conditions do not improve. The trouble is largely due to the shortage of tank steamers; the Government requirements, submarine activity, and mine "incidents," having combined to reduce the available tonnage, while the demand, instead of diminishing, for most classes of oil and spirit has increased. The augmentation of working expenses, too, has helped to enhance the price of all grades of oil. From the "Petroleum Review," it may be learned that the total shipments of petroleum products into the United Kingdom during January amounted to 32,839,390 gallons, or 9,862,199 gallons less than in December. This is a considerable difference. Of the total, 7,679,150 gallons were gas oil (Solar), 6,998,330 gallons benzine, 982,370 gallons fuel oil, and the remainder practically all illuminating and lubricating oils. However, as to the shortage of tonnage, one authority states that American shipbuilding yards are very busy on the production of additional oil-carrying steamers. But even including the tonnage under construction and afloat, the whole will be only about equal to the transport of sufficient fuel oil to displace 1 per cent. of the world's production of coal. In connection with this statement, the computation is interesting that a ton of oil

when used for steam-raising purposes is about equal to 1½ tons of coal, and when used in internal combustion engines, such as the Diesel, is equal to something like 4 tons of coal.

Institution Annual Meeting.

The Council of the Institution of Gas Engineers are wise in coming to an early decision respecting the character of the annual meeting which is to be held in London, on Tuesday, June 6. There is not the remotest chance of the end of the war being reached by June; and, if there were, the end of the war is not going to witness the termination of the inglorious muddle in which the world finds itself to-day as a result of the terrible upheaval. With, too "bolts from the blue," and just when least expected, the gas engineer feels that his place is always now within easy reach of his works. Moreover, the general conditions of things do not improve; and, in the keenest of judgments, they are going to be still worse before they are given the opportunity by the declaration of peace of beginning to mend. Therefore, all things considered, the Council have taken a prudent course in again deciding upon a one-day meeting, the only prepared items for which will be the address of the President (Mr. John Young), the reports of the Council and the various Committees, and other purely formal business. Many things may happen in the (all but a week from date) four months before the meeting is held; but we are certain of this, that the resolve will be made early that nothing that can be avoided will prevent as many members as possible coming up to London to support, and do honour to, the one and only John Young who counts among them, and to chat over affairs with old professional friends.

Sulphuric Acid under Control.

In a footnote appearing on p. 244 of our issue for Feb. 1, the announcement was made that the Government had decided to "control" the makers of sulphuric acid, with the view to the regulation of prices and the securing of better distribution. The prices and difficulties associated with the obtaining of supplies was helping to wreck sulphate of ammonia production; in fact, it is stated that at certain coke-oven plants, the manufacture of sulphate of ammonia was, through these causes, already discontinued. The same troubles were operating with serious disadvantage on the whole of the chemical industry's work in which sulphuric acid is a basic necessity. The prediction of a fortnight ago has now been fulfilled; and from yesterday, as will be seen from the announcement elsewhere, maximum prices rule for the sale of sulphuric acid. Delivered into railway trucks, carts, or barges at makers' works, the maximum prices are to be: Arsenical acid (140° Twaddel), £3; dearsenical (144° Twaddel), £3 15s.; arsenical acid (168° Twaddel), £5 15s.; dearsenical acid (168° Twaddel), £6—the last two 93 to 95 per cent. sulphuric acid. Though "controlled" prices, these are enormous as compared with those preceding the war. Take dearsenical acid (144° Twaddel), to which is now attached a maximum price of £3 15s., this was procurable at (say) 30s. to 40s. before the war; whereas the average for the country lately may be taken as between £5 and £6; while in some of the outlying districts of Lancashire, prices of from £9 to £10 were known. These are ruinous figures. The Government have not moved too early in producing partial relief in the general interests of the country, though the new maximum prices are very favourable to makers, and burdensome to users, compared with pre-war ones.

Care in Contracts.

However great may be the care which councillors and officials exercise in connection with contracts entered into by their corporations or councils—and admittedly great care is exercised—it is, no doubt, well that note should be taken of a warning which is contained in a case heard a short time ago by Mr. Justice Lawrence, while presiding at the Kent Assizes. The defendants were a borough surveyor and an alderman of the Corporation he was serving under; and they admitted the offence, which it was stated had been committed without any suggestion of fraud and dishonesty. The amount involved was quite trifling; and it was not claimed that the price charged for the goods in question was above the ordinary market rate. Briefly, the facts were that the surveyor, requiring a few iron pipes to carry out a job for the Corporation, asked a firm to supply them one of the members of which was an alderman of the Corporation. The goods were supplied; and—apparently in view of the Statutes prohibiting councillors being concerned in any contract with the body of which they happen to be members—it was arranged, it is said on the proposal of the surveyor, that the account should be rendered in the name of one of the firm's clerks. Another small order followed; and the account then was made out in the name of a different clerk, who, happening to occupy a public position, saw the accounts of the Corporation, among which his own name appeared. Investigation followed; and the documents were forwarded to the Director of Public Prosecutions. It was felt to be in the general interest that a prosecution should be undertaken "for the purpose of showing that members of corporations or councils cannot, without the risk of legal proceedings, enter into trading arrangements with officials or others connected with these corporations or councils, and then sit and pass payments to themselves under assumed names." That councillors cannot legally do any such thing, they must know; the lesson of the case under notice is that the penalty for acting illegally may be severe—in this instance it was a fine of £25, and payment of one-half the cost of the prosecution. To officials—who, of course, also know the law—the lesson is that they must not, against their better judgment, allow themselves to become parties to such illegality. Doing so, cost this surveyor £5, and one-half of the expenses of the prosecution.

Certified Occupations.

In connection with the letter of Mr. W. T. Dunn to members of the Institution of Gas Engineers (which is noticed on another page of this issue), on the subject of enlistment and gas-works employees, it may be pointed out that a complete list has been issued of certified occupations under the Military Service Act, 1916; the price being one penny. It must, however, be understood that the list is not to be regarded as final. It will be subject to revision from time to time, as the industrial situation of the country may demand—occupations being added to, or withdrawn from, the list. There are a large number of occupations the work of men in which, the Government Departments concerned have certified, under section 2 of the Military Service Act, after consultation with the Army Council, is of national importance; and it is the men engaged in these occupations who, subject to the provisions as to individual certificates contained in the regulations to be issued under the Act, are exempted from the Act. Any man whose principal and usual occupation is one of those named in the list, and who wishes to be exempted from the provisions of the Act, must obtain an individual certificate of exemption by applying to the local tribunal of the place of his employment, unless he is a man who is employed in connection with coal mining—when his case will be treated in accordance with arrangements made by the Home Office. All certificates of exemption are liable to review in accordance with the Act and the regulations. A certificate held on the 1st prox. in connection with an Admiralty, War Office, or War Service badge is a certificate of exemption; and anyone holding such a certificate need not ordinarily apply for a certificate to the local tribunal on grounds connected with employment.

British Industries Fair.

The second British Industries Fair organized by the Board of Trade, with the idea of giving firms an opportunity of exhibiting goods of their own manufacture, and of bringing them into touch with both home and over-sea buyers, is to open next week. It has been arranged in consequence of the success of the previous one, which took place last May, the business transacted at which exceeded all expectations. Admission, it may be remembered, was by invitation of the Board of Trade; and the general principle was followed of restricting these invitations to *bonâ-fide* trade buyers. In order that it should in no way interfere with the manufacture of munitions and other Government supplies, it has been decided to confine the Fair this year to manufacturers in five separate trades, the only one of which having any particular interest for "JOURNAL" readers is glass and glassware. Last year the Fair was held in the Royal Agricultural Hall; but on this occasion all suitable buildings in London, with a single exception, were from one cause or another unavailable. The exception was a part of the buildings of the Victoria and Albert Museum; and there was the less hesitation on the part of the President of the Board of Trade in asking the sanction of the Board of Education to the holding of the Fair there because it was felt that such a proposal was in accordance with the purpose which the museum was designed to serve. As a matter of fact, the primary object of its founders was to provide models for, and otherwise to aid, the improvement of such manufactures and crafts as are associated with decorative design. Owing to the fact that many of the permanent exhibits of the museum had already been removed to places of greater safety, space was available in the museum buildings which could be temporarily adapted to the purposes the Board of Trade had in view without causing any serious inconvenience to the public or risk to the contents. The Fair will remain open from the 21st inst. until the 3rd prox.

PERSONAL.

The Royal Institution have elected Professor W. A. BONE, D.Sc., Ph.D., F.R.S., a Member.

Mr. ALWYNE MEADE has been appointed Manager of the Wapping works of the Commercial Gas Company.

The Society of Public Analysts and Other Analytical Chemists held their annual general meeting on the 2nd inst., when the Council for the ensuing year was elected—Dr. HAROLD G. COLMAN being appointed one of the Vice-Presidents.

At the ordinary meeting last Tuesday of the Institution of Civil Engineers it was reported that Mr. H. C. HEAD, the Engineer and General Manager of the Winchester Water and Gas Company, had been transferred from the class of associate members to that of member.

Mr. J. H. ELLIOTT, the Assistant Manager at the Exmouth Gas-Works (who is leaving there to take up the position of Superintendent of the Flathouse works of the Portsea Island Gas Company), was presented last Wednesday by the staff with a silver kettle and spirit lamp, suitably inscribed. Mr. W. E. Dean (the Manager), in making the presentation, said they were all sorry to lose Mr. Elliott; and they sincerely wished him and Mrs. Elliott the best of health in the future, and every success. Mr. Elliott cordially thanked the staff for the kindness they had shown him during the fifteen months he had spent at Exmouth.

OBITUARY.

News has reached Leeds of the death in Canada of Mr. THOMAS E. SEARLE, who was formerly the local Manager of a firm of gas-retort builders. He was seriously ill at the time of the outbreak of war, but when he recovered enlisted in the Canadian forces. He, however, contracted pneumonia, from which he has died.

Major P. D. FORRETT, of the 5th Northumberland Fusiliers, has been killed in action. He was a native of Alfreton, Derbyshire, being a younger son of the late Mr. Thomas Forrett, who was for many years Manager of the local Gas Company. He was a keen Territorial, and joined the forces in the early stages of the war, receiving rapid promotion during his service in the field.

The death took place, somewhat suddenly, after a short illness, last Sunday week, of Mr. JOHN GANDON, the Engineer and Manager of the Ottoman Gas Company's works at Smyrna, to which position he was appointed in 1890—succeeding Mr. H. W. Andrews, who then became Consulting Engineer in London to the Company. Mr. Gandon, whose death at a comparatively early age—he was in his 54th year—will be widely regretted, was on a visit to England, and died at Sydenham; the burial taking place on Thursday, in Nunhead Cemetery. After being educated at the Surrey County School, Cranleigh, he became pupil to his father, the late Mr. Charles Gandon, at the works of the then Crystal Palace District Gas Company; and was for some time at the Saltley works of the Birmingham Corporation Gas Department, subsequently becoming Manager to the Ascot District Gas Company, with whom he remained some three years. Mr. Gandon left Smyrna last March for Athens, in order to transact business from there for his Company, and to communicate with his London office; but he was unable to return to Smyrna, on account of the blockade. He therefore came to England in August, leaving the elder of his two sons, Cecil, in charge of the works at Smyrna. His younger son, Kenneth, is engaged under Mr. S. Y. Shoubridge, at the South Suburban Gas Company's works. Mr. Gandon was an associate member of the Institution of Civil Engineers. Besides the two sons, there is one daughter; and he also leaves a widow. With all of them sincere sympathy will be felt.

British Commercial Gas Association.

The measure of the activities of the British Commercial Gas Association will not be made by the size of the official report of the proceedings at the fourth annual meeting, which was held in London last October. Circumstances for which this country was in no way responsible, made it necessary, as was the case in the previous year, to confine to *agenda* within the narrowest practicable limits, and to carry through such business as had been arranged at one sitting. The "Transactions" open with the report of the General Committee; and this is followed by comments of the Technical Press. Then we come to the report of the proceedings at the meeting itself—the short address of the President (Bailie Thomas Paxton, J.P., of Glasgow), and the adoption of the report and accounts, which were submitted by Mr. F. W. Goodenough (the Chairman of the Executive). The report of the meeting is followed by several appendices. There are the long list of gas undertakings and firms who support the Association, names of publicatians in which the Association's advertisements have recently appeared, subjects upon which assistance has been rendered to members, and matters dealt with in "A Thousand-and-One Uses of Gas." From these appendices, the reader is able to form some slight idea of the amount of work that is got through by those in whose hands the administration of the affairs of the Association is placed. The final pages of the report are devoted to the accounts for the twelve months to Aug. 31 last and the constitution and rules of the Association.

THE ROAD BOARD AND TAR TREATMENT.

Treasury Grant for the Current Year.

IN view of the apprehension that existed in certain quarters that the usual grant made by the Treasury to the Road Board would be restricted or entirely discontinued this year—thereby adding to the difficulties arising out of the present congestion of tar products, principally pitch—our readers will learn with satisfaction that the Secretary of the Institution of Gas Engineers has received an official intimation that the Treasury have sanctioned a similar grant this year to the Road Board to that made last year.

ENLISTMENT OF GAS-WORKS EMPLOYEES.

IN a circular-letter, dated the 11th inst., sent out (on the instructions of the Council, as noted in another column) to the members of the Institution of Gas Engineers, on the subject of reserved occupations in the gas industry, Mr. Walter T. Dunn, the Secretary, says:

In the "list of occupations (reserved occupations) of cardinal importance for the maintenance of some other branches of trade or industry," issued by the Reserved Occupations Committee of the Board of Trade, "Gas-Works Service" was included, and the following note added with reference to it:

> Public Utility Services—Gas, electric light, and power corporations, water-works, tramways, and canals—Skilled men in these undertakings, if attested and classified in Section B (Army Reserve), will not be called up for actual service with the Colours unless their employer states that their services can be spared.

I am directed by the Council to inform you that the Board of Trade have now forwarded to the Institution a revised list of reserved occupations relating to Public Utility Services, in which the following exemptions appear:—

> Gas-Works.—All classes of workmen inside the works.
>
> All Industries.—Mechanics, &c. Mechanics and other similar men engaged in the maintenance and repair of plant, machinery, and tools. Carters, lorrymen, and draymen (horse or power). . . . in all trades, not engaged in collecting from, or delivering to, private houses.

GAS INSTITUTION COUNCIL MEETING.

Date Fixed for the Annual General Meeting.

A Meeting of the Council of the Institution of Gas Engineers was held at the offices, No. 39, Victoria Street, Westminster, on Monday of last week—the PRESIDENT (Mr. John Young, of Hull), in the chair.

LOSSES AND NEW MEMBERS.

It was reported that since the last meeting the deaths had occurred of Professor Vivian B. Lewes (honorary member), Mr. John Gandon, of Smyrna, and Mr. Olaf Pihl, of Kristiana (members), and Mr. William J. Dowse, of Bradford (associate member). The sympathy of the Council was suitably expressed.

The following applications for the class of member were approved: Mr. Joseph Brettle, of Sedgley; Mr. Charles Henry Carder, of Oldbury; Mr. George Bernard Fiddes, of Leicester; Mr. Reginald George Luxon, of Launceston; and Mr. Arthur Robert Wyatt, of Seaton. Mr. George Perkins, of Hull, was approved for the class of associate member. The following were transferred from the class of associate member to member: Mr. Charles M. D. Belton, of Shrewsbury; and Mr. G. M. Gribble, of Kirkby-in-Ashfield.

ANNUAL GENERAL MEETING.

Preliminary arrangements were considered for the annual general meeting in London; and it was decided to hold it on Tuesday, June 6. The President's address, the Council's annual report, reports of Committees, and other business, only will be taken. It was arranged that the election of officers and new members of Council shall proceed as usual.

In regard to the "Birmingham Medal," it was decided not to make the award this year.

PLUMBERS' AND GAS FITTERS' INQUIRY.

A report on the result of the inquiry circular with reference to plumbers and gas-fitters which was issued by the Institution was presented; and a communication from the City and Guilds of London Institute was submitted, This indicated that they were of opinion that recent developments in the use of gas render it desirable that a gas-fitter should undergo a special training of at least three years, dealing largely with matters not connected with plumbers' work; that a proved demand has been shown to exist for specialized instruction in gas-fitting; and that for these reasons, among others, the Committee of the Institute have decided to continue their separate syllabuses and examinations in this subject.

At the request of the City and Guilds of London Institute, a

proposal was considered for the revision of the syllabuses of the examinations in "Gas Supply;" and a Committee was appointed to deal with the matter. Mr. Walter Hole was unanimously nominated for re-appointment as Examiner in the subject.

Institution certificates for gas-fitters were issued to 94 candidates. [A list of these is appended by the Secretary, Mr. W. T. Dunn, to the official report of the Council meeting.]

A Grant for Research.

The Committee reported that they had succeeded in obtaining a grant from the Committee of the Privy Council for Scientific and Industrial Research, in aid of the Refractory Materials Research, and that applications for assistance in regard to the researches on Ventilation and Gas Heating, and Carbonization, were under consideration.

Life of Gas-Meters.

Progress was reported with reference to the inquiry on the life of gas-meters, which was considered satisfactory. It was resolved that the investigation should be continued.

Enlistment of Gas Workers.

A report was presented showing the action taken since the last Council meeting with regard to the enlistment of gas-works employees, including various interviews with the Board of Trade on the subject. The receipt of a revised list of reserved occupations in the gas industry was reported; and the Secretary was instructed to forward a copy to the members of the Institution.

Coal Supplies.

Correspondence with the Board of Trade with regard to the maintenance of coal supplies to gas undertakings, and the assurance of their attention in cases of difficulty, was reported.

Questions relating to the operation of the Price of Coal Limitation Act were introduced; and the Coal Supplies Committee were requested to give the matter early consideration.

The Council considered the subject of the pooling of coal-waggons; but, as the matter appeared to be in abeyance, it was not deemed advisable to take any action.

Tar and Sulphuric Acid.

A communication was read drawing attention to the serious difficulties in which many undertakings would be placed if the use of tar for road purposes were restricted or prohibited. Information, however, was available that quite recently the Treasury had agreed that a sum equal to that expended in the past year should be devoted to the repairs of roads during 1916.

The attention of the Board of Agriculture and Ministry of Munitions was to be called to the serious shortage of sulphuric acid, and the consequent wastage of ammoniacal liquor, at a time when ammonia is so urgently required for munition purposes. These Departments were to be asked to receive a deputation.

Other Matters.

An invitation was received from the British Association Fuel Economy Committee for the appointment of a representative of the Institution on the Committee. Mr. A. E. Broadberry, Vice-President, was appointed.

The reports of the Finance Committee and of the Parliamentary Committee were presented and adopted. The former included the accounts for the year ended Dec. 31, 1915.

A request from the Engineering Association of New South Wales for an exchange of publications was acceded to.

It was reported that Mr. H. D. Madden, of Cardiff, had been appointed District Member of Council for the ensuing year to represent the Wales and Monmouthshire District Institution of Gas Engineers and Managers.

PHOTOMETRICAL NOMENCLATURE AND STANDARDS.

American Proposals.

It will be remembered that in December, 1912, a Sub-Committee of the Illuminating Engineering Society of New York, which had been appointed to deal with the question of photometrical units, presented a report in which were submitted certain definitions of photometrical quantities that it was suggested should be tentatively adopted. Since the Sub-Committee consisted of men of high scientific distinction—viz., Professor A. Blondel, Dr. A. E. Kennelly, Professor E. L. Nichols, Dr. E. B. Rosa, and Professor C. H. Sharp—its report was received with much interest; and careful consideration was given to its recommendations in Europe as well as in America. In this country a critical review of the proposed definitions was presented by Mr. A. P. Trotter, at a meeting of the Illuminating Engineering Society on May 21, 1914, and a useful and instructive discussion took place on Mr. Trotter's communication [see "Journal," Vol. CXXVI., p. 577].

It was generally felt at the time that the matter was one which would have to be discussed by the National Illumination Committees of the different countries, with a view to agreement (only tentative, perhaps, in the first instance) on a number of definitions at an early congress of the International Commission on Illumination. But a few months later war broke out, and the prospect of any general international discussion or agreement on this and other scientific and technical questions is now somewhat remote. Nevertheless, the American Committee has continued its efforts to draft an acceptable set of definitions of photometric quantities, and has presented a further report which was read at the Ninth Annual Convention of the American Illuminating Engineering Society on Sept. 20-23 last year, and has been reprinted in the last issue to hand of the "Transactions" of the Society. The criticisms of the former report that were offered by Mr. Trotter and others do not appear to have influenced the Committee to make any substantial changes in their proposed definitions.

The first portion of the present report is identical with that issued in December, 1912; the definitions of all the following terms remaining unaltered—viz., Luminous Flux, the Stimulus Coefficient for Radiation and its Mean Value, Luminous Intensity, Illumination, Candle, Candle-Power, Lumen, Lux, Exposure, Brightness, Normal Brightness, Specific Luminous Radiation, Coefficient of Reflection, Coefficients of Regular and Diffuse Reflection, Primary Luminous Standard, Representative Luminous Standard, Reference Standard, Working Standard, Comparison Lamp, Test Lamp, Performance Curve, Characteristic Curve, Mean Horizontal Candle-Power, Mean Spherical Candle-Power, Mean Hemispherical Candle-Power, Mean Zonal Candle-Power, and Spherical Reduction Factor.

In accordance, however, with the report of the Committee on Progress of the American Society [see "Journal," Vol. CXXXII., p. 435], the term "Lambert" has been adopted for referring to "brightness" in lumens per unit projected area. It is interpreted as the equivalent in appearance to the eye of a surface source emitting one lumen per unit area, in accordance with Lambert's cosine law. The resolution regarding the expression of output and rating of illuminants, which was adopted by the Council of the American Illuminating Engineering Society in December, 1914 [see "Journal," Vol. CXXVIII., p. 741], and is reproduced in the report of the Committee on Progress already mentioned, is also now embodied in the Definitions of the Nomenclature and Standards Committee of the Society.

Other additions which have been made to the definitions since they were given in the December, 1912, report are: Horizontal Distribution Curve, Vertical Distribution Curve (both following in order the definition of Characteristic Curve), and Lamp. The definition of "Lamp," which precedes that of Primary Luminous Standard, is commendable for its brevity—being "a generic term for an artificial source of light." There have also been added a number of other recommendations and definitions relating to the employment of photometry in the practical testing of lamps, &c., and these will be read with interest by many photometric operators who may have thought that the original report of the Committee had very little bearing on every-day photometry. These additions to the report should do more to render it acceptable in circles outside the little coterie of speculative physicists than all the commendations of committees and professors. Nevertheless, as appeared from the discussion initiated by Mr. Trotter's paper in 1914, it is highly improbable that the definitions will be accepted in this country until they have undergone considerable modification and re-arrangement.

The tabular statement of "Photometric Units and Abbreviations," proposed by the Committee, which appeared in the December, 1912, report contained eight items. It has now been extended to twenty items, and is reproduced below. Many of the proposed symbols or abbreviations are scarcely likely, it appears to us, to meet with any general acceptance, as they have neither the credentials of old friends nor the stamp of incomparable appropriateness. Their publication, however, may well lead to the evolution of symbols whose fitness will make an irresistible appeal to photometrists generally.

In addition to the tabular statement of photometric units and abbreviations, the text of the definitions which have now been added to those which appeared in the earlier (1912) report is reproduced in full below.

Lambert.—The "C.G.S." unit of brightness, the brightness of a perfectly diffusing surface radiating or reflecting one lumen per square centimetre. This is equivalent to the brightness of a perfectly diffusing surface having a coefficient of reflection equal to unity and illuminated by one phot. For most purposes, the millilambert (0·001 lambert) is the preferable practical unit.

A perfectly diffusing surface emitting one lumen per square foot will have a brightness of 1 076 millilamberts.

Brightness expressed in candles per square centimetre may be reduced to lamberts by multiplying by $\pi = 3{\cdot}14$.

Brightness expressed in candles per square inch may be reduced to foot-candle brightness by multiplying by the factor $144\,\pi = 452$.

Brightness expressed in candles per square inch may be reduced to lamberts by multiplying by $\pi/6{\cdot}45 = 0{\cdot}4868$.

In practice, no surface obeys exactly Lambert's cosine law of emission. Hence the brightness of a surface in Lamberts is, in general, not numerically equal to its specific luminous radiation in lumens per square centimetre.

Defining equations:

$$L = \frac{dF}{dS}$$

or, when uniform,

$$L = \frac{F}{S}.$$

Horizontal Distribution Curve.—A polar curve representing the

luminous intensity of a lamp or lighting unit in a plane perpendicular to the axis of the unit, and with the unit at the origin.

Vertical Distribution Curve.—A polar curve representing the luminous intensity of a lamp or lighting unit in a plane passing through the axis of the unit and with the unit at the origin. Unless otherwise specified, a vertical distribution curve is assumed to be an average vertical distribution curve, such as may in many cases be obtained by rotating the unit about its axis, and measuring the average intensities at the different elevations. It is recommended that in vertical distribution curves, angles of elevation shall be counted positively from the nadir as zero to the zenith as 180°. In the case of incandescent lamps, it is assumed that the vertical distribution curve is taken with the tip downward.

Photometric Tests in which the results are stated in candle power should be made at such a distance from the source of light that the latter may be regarded as practically a point. Where tests are made in the measurement of lamps with reflectors, the results should always be given as "apparent candle power" at the distance employed, which distance should always be specifically stated. The output of all illuminants should be expressed in lumens.

Illuminants should be rated upon a lumen basis, instead of a candle-power basis.

The Specific Output of Electric Lamps should be stated in terms of lumens per watt, and the specific output of illuminants depending upon combustion should be stated in lumens per British thermal unit per hour. The use of the term "efficiency" in this connection should be discouraged.

When auxiliary devices are necessarily employed in circuit with a lamp, the input should be taken to include both that in the lamp and that in the auxiliary devices. For example, the watts lost in the ballast resistance of an arc lamp are properly chargeable to the lamp.

The Specific Consumption of an electric lamp is its watt consumption per lumen. "Watts per candle" is a term used commercially in connection with electric incandescent lamps, and denotes watts per mean horizontal candle power.

Life Tests.—Electric incandescent lamps of a given type may be assumed to operate under comparable conditions only when their lumens per watt consumed are the same. Life test results, in order to be compared, must be either conducted under or reduced to comparable conditions of operation.

In Comparing Different Luminous Sources, not only should their candle power be compared, but also their relative form, brightness, distribution of illumination, and character of light.

Lamp Accessories.—A "reflector" is an appliance the chief use of which is to redirect the luminous flux of a lamp in a desired direction or directions. A "shade" is an appliance the chief use of which is to diminish or to interrupt the flux of a lamp in certain directions where such flux is not desirable. The function of a shade is commonly combined with that of a reflector. A "globe" is an enclosing appliance of clear or diffusing material, the chief use of which is either to protect the lamp or to diffuse its light.

PHOTOMETRIC UNITS AND ABBREVIATIONS.

Photometric Quantity.	Name of Unit.	Abbreviations, Symbols, and Defining Equations.
1. Luminous flux	Lumen	F. ψ
2. Luminous intensity	Candle	$I = \frac{dF}{d\omega}$, $\Gamma = \frac{d\psi}{d\omega}$, cp.
3. Illumination	Phot, foot-candles, lux	$E = \frac{dF}{dS} = \frac{I}{r^2} \cos\theta . \beta$
4. Exposure	Phot-second	Et
5. Brightness	Apparent candles per sq. cm. / Apparent candles per sq. in.	$b = \frac{dI}{dS \cos\theta}$
	Lambert	$L = \frac{dF}{dS}$
6. Normal brightness	Candles per sq. cm. / Candles per sq. in.	$b_0 = \frac{dI}{dS}$
7. Specific luminous radiation	Lumens per sq. cm. / Lumens per sq. in.	$E' = \pi b_0 . \beta'$
8. Coefficient of reflection	—	$m = \frac{E'}{E}$
9. Mean spherical candle power		scp
10. Mean lower hemispherical candle power		lcp
11. Mean upper hemispherical candle power		ucp
12. Mean zonal candle power		zcp

13. 1 lumen is emitted by 0·07958 spherical cp.
14. 1 spherical candle power emits 12·57 lumens.
15. 1 lux = 1 lumen incident per square metre = 0·0001 phot = 0·1 milliphot.
16. 1 phot = 1 lumen incident per sq. cm. = 10,000 lux = 1000 milliphot.
17. 1 milliphot = 0·001 phot = 0·929 foot-candle.
18. 1 foot-candle = 1 lumen incident per square foot = 1·076 milliphot = 10·76 lux.
19. 1 lambert = 1 lumen emitted per square centimetre.
20. 1 millilambert = 0·001 lambert.

BRITISH GAS LEGISLATION UNDER AMERICAN EXAMINATION.

Special Consideration being Given to the Sliding-Scale.

THE year 1905 was an important one for the Boston Consolidated Gas Company; for certain happenings of that year, as detailed in various reports published in the "JOURNAL" during 1906, led to the application to the Company of the sliding-scale—partly, but not wholly, in the ordinary British form. The investigation made prior to its application was a very thorough one. A Special Committee appointed by the Massachusetts Legislature reported. Mr. Nathan Matthews, LL.D., also prepared a report at the request of the Company; and so did Messrs. Stevenson and Burstal at the request of the President of the Company. These reports, being the results of deliberate and unbiased studies of the sliding-scale—and mostly from outside—were interesting and instructive, and disclosed a very comprehensive range of investigation. The result of all the work then done was that the Massachusetts Legislature in 1906 adopted the sliding-scale for the Boston Company. The initial price of gas was put at 90 c.; and the standard rate of dividend at 7 per cent. It was provided that for every reduction in any year of 1 c. below the standard price, the Company might increase their dividends for the following year by one-fifth of 7 per cent. This was a one-way scale, or rather a sliding with a maximum price; the Company being prohibited from charging more than the standard price. The Act of 1906, so applying the sliding-scale to the Company, provided that, at any time after the expiration of ten years, the Board of Gas and Electric Light Commissioners should have authority, upon the petition of the Company, or the mayor of any city, or the "selectmen" of any town in which the Company are supplying gas, to lower or raise the standard price per 1000 cubic feet "to such extent as may justly be required by reason of greater or less burdens which may be imposed upon the Company by reason of improved methods in the art of manufacture, by reason of changes in the prices of material and labour, or by reason of changes in other conditions affecting the general cost of the manufacture or distribution of gas." This clause becomes operative this year; and provision has been made by the Board of Gas and Electric Light Commissioners for a further investigation of the sliding-scale system.

Meantime, we have had the pleasure of again welcoming Mr. Nathan Matthews to this country; he having been commissioned by the Boston Company to ascertain what changes, if any, had taken place since 1905 in the laws and management of English gas companies with special reference to the sliding-scale. The report resulting from this visit has just been issued in book form; and useful completion is given to it by prefacing the results of the fresh investigation with the report made by Mr. Matthews a decade ago. He must be congratulated upon the interest he has discovered in the legislative proceedings of this country during the past ten years. Those of us who live in close view of the developments and changes as they arise, and accept them, and pass on to the current fresh interests, do not perhaps measure them in their fullness as the competent man who comes from outside, and makes survey over an extended period. Therefore the interest in the fresh report.

THE MODEL CLAUSES.

There is little change in the model clauses for Mr. Matthews to chronicle. The most important alteration is the substitution of the calorific power standard for the illuminating power one. He mentions that a calorific value of 540 B.Th. U. is prescribed, and that no penalty comes into force unless the gas falls below the standard by more than 7½ per cent. It should be pointed out that the 540 B.Th.U. is with the total heat test, and further that Parliament is now allowing 500 B.Th.U. (without a margin), also with the total heat test. Regarding the statement that discounts are not permitted to exceed 10 per cent. for prompt payment and 15 per cent. for large consumption, it may be remarked that gas undertakings are not tied to these fixed percentages; but there is the alternative under which a company may allow what discount they please, "provided that every such contract entered into by the company shall be alike in terms and amount under like circumstances to all consumers." In connection with the prepayment clause, the excess of 10d. for meters and fittings is mentioned, but it should be stated that 1s. is the maximum excess if a cooker is included in the "fittings." Information is given from the last Parliamentary Returns; and noted is the progress of consolidation through the amalgamation of undertakings.

GENERAL LEGISLATIVE TENDENCIES.

Concerning the London Companies, apart from special legislation, the matter that struck the reporter most is the "marked improvement that there has been in the management and financial condition of the Gas Light and Coke Company; the price charged by the Company in 1913 being 2s. 6d. or 6d. per 1000 cubic feet less than in 1903." As to general tendencies since 1903, Mr. Matthews says the changes as to illuminating power, consumption, and prices, may be summarized as consisting of a marked inclination to substitute the calorific standard for candle power, of an increase in consumption of over 30 per cent., and of a general reduction in manufacturing costs and prices until the increase in the net cost of coal brought about by the present war.

The effect of the recent advance in the cost of coal was generally to cause a slight increase in prices during the latter half of 1914, and a large increase during the first six months of 1915.

Transition to the Sliding-Scale.

Mr. Matthews finds there has been a considerable extension of the application of the sliding-scale. Out of the 520 private authorized undertakings operating in 1912, 258, or 50 per cent. had adopted the system, and were responsible for 70 per cent. of the total amount of gas sold in the United Kingdom by the authorized private undertakings. The corresponding figures for Jan. 1, 1904, were 202, 44 per cent., and 68 per cent. Since 1912, York and Liverpool, two large maximum dividend companies—that for Liverpool being the largest in the United Kingdom—have gone over to the sliding-scale, and several smaller companies have done the same. At the present time, in Mr. Matthews' estimation, the sliding-scale companies must furnish about 75 per cent. of the aggregate amount of gas sold by the authorized companies. The *per capita* consumption of gas in England and Wales in 1912 was 5444 cubic feet. In 1913, and the first half of 1914, gas was being sold, as a rule, at prices lower than those obtaining in 1903 or 1905. This, Mr. Matthews remarks, was made possible by the increase in sales, and by the lowering of the requirements as to illuminating power and purity; and he might have added by a general improvement in administration, and by the change from the high-temperature carbonization of coal in light charges to the high-temperature carbonization of heavier charges over a greater number of hours—resulting in higher makes per ton, and less depreciation of the quality of the gas and other products.

Protection of Sliding-Scale Conditions.

A matter of considerable importance to the Boston Company at this particular time is the fact that Mr. Matthews is able to report as to the disinclination of Parliament to alter the prescribed figures in the sliding-scale as applied to any company if it is likely to interfere with the dividend sanctioned by the legislature, and which constitutes the basis of sale of new stock or shares under the auction clauses. Admittedly, there have been changes in the standard prices of sliding-scale companies; but "no case has been discovered in which the company did not secure some special consideration or equivalent for the reduction in their standard price, nor any case in which the reduction was sufficient to cause any diminution in the rate of dividend paid." The power to enforce a reduction in the standard price when fresh privileges are sought and granted, is exercised by Parliament with much restraint. Out of more than 300 Acts passed since 1876 extending to sliding-scale companies additional privileges by way of capital or consolidation powers, or in the form of some reduction of the standard of illuminating power, a decrease in the standard price has been insisted on in only 26 cases—less than 10 per cent.

Increased Sales with Lower Average Capital.

A peculiarly interesting section of the report is the one showing how, although capitalization has considerably increased during the past ten years, this has not had correspondence with the increase in the sales of gas—thus resulting in a lower average capital per 1000 cubic feet of gas sold. Figures are furnished for 27 English companies, who in 1912 were selling 500 million cubic feet or more of gas, which show this trend of capital in relation to business done by comparing 1903 with 1912.

—	1903.	1912.	Inc. or Dec.
			Per Cent.
Fourteen sliding-scale companies—			
Corrected capital*	£26,782,188	£30,127,109	Inc. = 12·4
Sales, millions of cubic feet . .	45,772·1	63,145·7	Inc. = 38·0
Capital per 1000 cubic feet sold .	11s. 8d.	9s. 6d.	Dec. = 18·5 [2s. 2d.]
Thirteen maximum dividend companies—			
Corrected capital*	£7,475,555	£8,398,482	Inc. = 12·3
Sales, millions of cubic feet . .	14,712·4	19,774·8	Inc. = 34·4
Capital per 1000 cubic feet sold .	10s. 2d.	8s. 6d.	Dec. = 16·5 [1s. 8d.]

* Outstanding share capital (less amounts nominally added by conversion), premiums received, and loans issued.

The figures for the large companies which appear in "Field's Analysis" are as follows

—	1903.	1912.	1914.
Corrected capital*	£30,574,221	£34,551,854	£35,501,033
Sales in million cubic feet . . .	55,091·3	71,220·2	74,208·5
Capital per 1000 cubic feet sold .	11s. 2d.	9s. 8d.	9s. 6d.

* Outstanding share capital (less amounts nominally added by conversion), premiums received, and loans issued.

The same trend of affairs is shown in this table—considerably increased sales, with diminished capital expenditure per 1000 cubic feet of gas sold.

Interest and Dividends.

Another table shows the aggregate amount paid for interest and dividends by the companies which figure in "Field's Analysis" (omitting the Alliance and Dublin Company):

—	1903.	1912.	1914.
Corrected capital	£30,574,221	£34,551,854	£35,501,033
Sales in million cubic feet . . .	55,091·3	71,220·2	74,208·5
Paid for interest and dividends* .	£2,271,932	£2,606,714	£2,665,324
Per cent. of capital	7·43 p.c.	7·54 p.c.	7·50 p.c.
Per 1000 cubic feet sold	9·8d.	8·6d.	8·4d.

* Including the amount, if any, carried by the sliding-scale companies to the reserve fund, and by the Gas Light and Coke Company, in 1912 and 1914, to the redemption fund.

The reporter states that it is hardly necessary to point out that, owing to the operation of the auction clauses, these are nominal rates only, and that the actual return to the investor is in the neighbourhood of 4 per cent. This, of course, is on loan and ordinary capital combined. If the ordinary capital alone were taken, it would be nearer the mark to say that "in the neighbourhood of 5 per cent."—somewhat under and somewhat over—has been in normal times the yield per cent. on the investment, as can be seen by our stock and share list at the end of June, 1914. By those who are studying British conditions, too, it should be noted that, in view of the rates of interest on the last War Loan and on the present issue of Exchequer Bonds, enterprises such as gas undertakings will not—anyway, for some time—be able to raise money on anything like the same terms as they have done in the past. The reporter observes that in the modernized form of the auction clauses, the prohibition against issuing stocks at below par is omitted; but, it should be noted, the prohibition is only annulled by individual applications to Parliament. The current auction clauses have not general application till they are specifically adopted in Special Acts.

Depreciation and Increased Stability.

It is remarked that stock conversions continue in favour; and the introduction of the special purposes fund is mentioned. The "purposes" it covers are stated; but manifestly its chief attraction in the eyes of Mr. Matthews is on account of the assistance it renders to depreciation. He finds that the result of the change in the law respecting depreciation has been to strengthen the position of the companies having regard to the relation between the capital and assets. He also observes that gas companies throughout the United Kingdom have in the last ten years been giving, more generally and fully, attention to "wear and tear." The effect of these changes in law and practice upon the Gas Light and Coke Company has been conspicuous; the outstanding share (unconverted), loan, and premium capital per 1000 cubic feet sold having been reduced from 13s. 6d. in 1903 to 11s. 4d. in 1914. Some of the larger companies, it is found, have succeeded in reducing the ratio of capital to sales by about 15 per cent. on the average. But, of course, these reductions cannot be attributed solely to attention to depreciation—the increased production per ton of coal carbonized, and the better utilization of plant through daylight consumption, and other improved conditions of business are factors of some account. However, the various depreciation funds carried by the few large companies mentioned in "Field's Analysis" have increased in the aggregate from £398,919 in 1903 to £714,053 in 1914—an increase of 79 per cent. Mr. Matthews repeats that the English companies are undoubtedly in a sounder position at the present time than they were in 1905.

Conclusions as to the Sliding-Scale.

The report proceeds to give additional information, showing the drift of opinion in favour of the sliding-scale, as attested by the number of concerns that have adopted it, and the interest shown by local authorities in furthering the change. On the experience in Great Britain, it is held that any scheme of official revision, whether occasional or periodic, is inherently inconsistent with the theory of the sliding-scale. There is a great deal more information as to the operation of the sliding-scale; and, in his conclusions, Mr. Matthews attributes a large part of the prosperity of the British gas industry to the system. Although the rate of price reduction during the period has not been much greater for the sliding-scale than for the maximum dividend companies, this he considers is a matter of relatively small concern, not only because of the considerations already noted, but owing to the fact that a period of increased costs and prices has now set in for all the companies. Upon all other points, the arguments for the sliding-scale are stronger than ever. The increase in service as measured by sales, the relations between the companies and their employees and consumers, the attitude of the local authorities, the position of the Board of Trade and of Parliament, the views of professional gas managers, the changes from the one system to the other, the number of companies under the sliding-scale, the business done by them, and "the complete cessation of any demand for public ownership" (later on the qualification is found "except in the case of the smaller plants")—these are all matters concerning which the sliding-scale companies occupy, with reference to the maximum dividend companies, a position of advantage greater even than was visible in 1905. In Mr. Matthews' view, a satisfactory system of gas company regulation should aim to secure six main advantages for the public: (1) Low price of gas; (2) progressive management; (3) extensions of service and sales; (4) harmony between company and employees; (5) satisfaction on the part of the consumers; and (6) a fair, permanent, and

easily understood basis for the relation between prices and profits. He finds, as the result of his further investigation, that, as between the maximum dividend companies and the sliding-scale companies, the balance of advantage in respect of price has been with the latter—not only in absolute figures, but as to the time when reductions are made. In respect of management, service, and the relations between the company and employees, the advantage is wholly with the progressive methods engendered by the sliding-scale. And the system is the only one yet invented which attempts successfully to regulate profits upon the basis of a just and fair division between company and consumers. There is no disposition in any quarter to change a system which, after forty years of constantly increasing use, has so completely proved its possession of these advantages.

MUNICIPAL OWNERSHIP.

In another place, reverting to the question as to the transfer of ownership from companies to municipal authorities, it is stated that, since the adoption of the sliding-scale in 1876, only about twenty companies working on this plan have been acquired by local authorities. Nine of these were taken over in the year of the adoption of the sliding-scale or the year after; and only about a dozen after operation under the sliding-scale—these latter plants being all of small concerns, selling on the average not more than 10 million cubic feet per annum. Of the fifteen municipal plants selling over 100 million cubic feet in 1903 which had been bought by the corporations from maximum dividend companies, four were taken over before 1880, ten between 1880 and 1890, and only one since—in 1901. There has, therefore, been only one large company taken over by a public authority in the past twenty-five years; and no sliding-scale companies at any time except concerns of very small size. In short, at the present time, there seems to be no demand whatever for the municipal exploitation of gas-works. The sliding-scale appears to have been accepted by the public authorities as a complete and preferable substitute.

WHAT OF BOSTON?

All this being the representation of the excellent position found by Mr. Matthews of matters in Great Britain in relation to the sliding-scale and an increased statutory liberty to gas undertakings, it would now be interesting to British gas men to have presented to them an account of the decade's sliding-scale experiences, under American conditions, of the Boston Consolidated Gas Company.

ELECTRICITY SUPPLY MEMORANDA.

PRIOR to the war, some of the manufacturers of electrical plant in this country did not have a particularly rosy time. Certain of them paid their debenture interest and preference dividend; but it was a fine distinction to be able to pay dividends on the ordinary shares. One reason for this was the tight grasp that German and Austrian manufacturers had attained on the British market, and the crippling influence that their methods had on the business expansion of genuine British firms. It is necessary to say "genuine" when referring to "British" electrical firms; for some of those sailing under British designations are so permeated with Teutonic capital and influences that they have no real title to be brought into any category labelled "British." The impediments to the export from Germany and Austria of electrical goods have been of great advantage to British manufacturing firms. This is pointed out in a review of the year which appears in the last issue of "The Times Engineering Supplement." Imports stopped, there had to be complete reliance for requirements upon the producing firms in this country. Then another advantage to the manufacturers has been that, though the Treasury and the Local Government Board have maintained an effective veto over capital expenditure for electrical plant and accessories where they could be dispensed with without injuring the output of war materials, there has been (so we gather from the article in question) more than adjustment of this, from the manufacturers' point of view, by the needs for lighting and motors in numerous establishments devoted to munitions work. We are afraid that, if it is all as painted, the low-profit earning "British" electrical firms (whatever be their composition) of pre-war days will not be happy in having a very careful scrutiny and assessment made of their so-called excess war profits, and in pouring into the Exchequer 50 per cent. of them. This will be, for those British concerns that have had a comparatively miserable existence through the operations of enemy firms, anything but an enjoyable parting with profits after the succession of lean years; but if the balance assists in providing some ordinary dividends, they will have occasion to remember the war in view of this, for them, exceptional occurrence. The article says that "it is satisfactory to be able to record that the industry has risen to the occasion, and that, in spite of difficulties in connection with the shortage of labour and materials, the efforts made have had an appreciable effect in increasing the output of war materials." We should have thought that it might have gone without saying that the electrical industry had risen to the occasion. Having such an exceptional opportunity, the industry would have been mad not to have made the most of it.

Coming into Their Own.

War and Other Experiences of the Year.

The article also gave information as to the outstanding features of the year in connection with electricity supply. The manufacturers of plant are not the only people that have benefited in the electrical industry; the supply undertakings have done so as well. The extensions made to existing engineering establishments, and the large numbers of new works that have been built, have created a demand on public supply stations for additional current for both power and lighting which was beyond the capacity of the existing plants. In all the great manufacturing centres, it is stated—Glasgow, Sheffield, Birmingham, Newcastle, Manchester, Leeds, Bristol, and elsewhere—the demand for current has been, and remains, on a scale considerably above normal. To meet this need, temporary supply stations have in some cases been put in service, and in others supplementary generating sets have had to be installed. But an interesting development has taken place in London. It is a much-talked-of project; but it has been long in taking even partial practical shape. The war has hastened it—the "it" being the interlinking scheme of the various electricity supply systems, so that stations blessed with surplus energy-producing capacity would be able to assist those on which the demand for current reached a maximum intensity. Some amount of difficulty, we are told in the article, arose owing to the varying voltages and periodicities of the systems. Nevertheless, progress has been made with the intercommunication work. Battersea, Hammersmith, and Fulham led the way in the linking-up of their stations; and later Shoreditch, Stepney, Hackney, and Poplar became allies, as well as Woolwich and the South Metropolitan Electric Supply Company. Probably further movement will be made in this direction; but there seems some hesitation in forfeiting any part of the complete independence of an undertaking, or in taking the first step on the high road to consolidation.

Progress in Intrinsic Brilliancy.

The "Illuminating Engineer" for January contained the paper that Professor J. T. Morris recently read, before the Illuminating Engineering Society, on "Recent Developments in Electric Incandescent Lamps," with special reference to the changes these have compelled in the methods of utilization. This was the occasion, too, on which the new Edison-Swan tungsten "arc-incandescent" lamp, to which reference was made in the "Memoranda" a few weeks since, was first exhibited. This lamp is, in the matter of intrinsic brilliancy, another product of electrical frightfulness. The manufacturers of electric-lamps, in their search for improvement, are diligent in obtaining greater light efficiency in relation to the expenditure of current, and simultaneously greater efficiency in the work of eye destruction. The more thoughtful ones in this connection see a red light, and are concerned lest the development of intrinsic brilliancy with progress in light efficiency should act disadvantageously to the electricity supply industry. The advances that have been made in intrinsic brilliancy are shown by this table from Professor Morris's paper:

Intrinsic Brilliancy of Electric Incandescent Lamps.

Lamps.	Candle Power or Watts.	Volts.	Watts per Candle Power.	Intrinsic Brilliancy (C.P./Sq In.).
Carbon	50 c.p.	100	3·5	381
"	50 c.p.	200	4·0	420
Nernst	66 c.p.	95	1·8	2,150
Osmium	32 c.p.	55	1·9	520
Tungsten	60 w.	—	—	—
Drawn wire	54·5 c.p.	100	1·1	1,030
" "	60 w.	—	—	—
" "	52 c.p.	200	1·15	1,095
"Half-watt"	360 w.	80	0·67	5,000
"	1490 w.	240	0·58	5,250
Tungsten "arc incandescent	100 c.p.	50 (?)	0·65	12;900

The table is worth very careful study. The rapid increase shown in intrinsic brilliancy with progress in light efficiency (the intrinsic brilliancy ascribed by Professor Morris to the misnamed "half-watt" lamp, with gas-filled bulbs, is 5000 candles per square inch!) has necessitated changes in the use of the lamps. Concealment of such filaments is imperatively necessary—at least in the view of electrical men with any conscience in regard to the matter. The coming into use, too, of these lamps means a larger recourse to indirect and semi-indirect methods of lighting, with the consequent depreciation in the amount of useful light available in relation to current consumption. Owing to the variety in the forms of filaments of electric incandescent lamps born within the last ten years, great discretion has to be exercised in making a right choice of shades and reflectors in order to maintain the efficiency as high as possible in the direction where the light is most required.

Unreliability of Low "Half-Watt" Units.

There was great jubilation in some electrical quarters recently, and less in others, over the advent of lower units of gas-filled "half-watt" lamps; but experience with them is not exactly of a satisfactory order. Nothing has been

said about this in the general electrical press; but certain members of the Illuminating Engineering Society are not in the habit of hiding acute faults—their mission in life being to find means of counteracting them. In the discussion on Professor Morris's paper, Mr. A. Cunnington (London and South-Western Railway Company) made this remark: "With 'half-watt' lamps, one could not afford to look upon cost of current as the only thing of importance. Maintenance was a very serious matter when each lamp cost a sovereign; and, in order to guard against the loss of a lamp through a temporary rise in voltage, it appeared to be worth while actually to under-run slightly, even if the maximum efficiency was not obtained." Then Mr. Leon Gaster piously expressed the hope "that manufacturers would exercise restraint, and not unduly push forward with the low candle-power high-voltage units until an adequate life was obtainable. In his experience, the life of these units was less satisfactory than that of the larger units." In Professor Morris's view: "Unless experience shows that a reasonable length of life can be expected from half-watt lamps, the result in the long-run will be far from proving a commercial success, owing to the high cost of lamp renewals." Insistence on the need for restraint on the part of manufacturers is also made in an editorial in the "Illuminating Engineer."

Heating Admissions.

Mr. George Wilkinson, of Harrogate, is not one of those perfervid short-visioned electrical engineers who cannot see good in anything but the particular commodity in which they are professionally interested. He has been reading a paper before the Leeds Association of Engineers, on the question of fuel economy; and, in the course of it he acknowledged that gas-fires confer a benefit by decreasing the amount of smoke and soot discharged into the atmosphere, and, by thus tending to economy, preserving the bye-products of coal. But he has no hope that householders will altogether abandon the open fire; and so he advocates slow-combustion grates, but only as a means of supplementary heating. These grates should, in his opinion, merely be used in cold weather—the primary source of heat for the house being furnished by hot water radiators supplied by slow-combustion stoves burning cheap fuel, such as coke. However, in time, the use of the open fire will be abandoned altogether; supplemental heating in the living rooms being obtained by the use of electric or gas fires. Labour-saving and convenience, in our opinion, will in time altogether annihilate the existing predominant preference for the open fire. However, notwithstanding the occasional wordy confidence expressed in the future of the electric "fire," the "Electrical Times" doubts whether householders will ever give up the open coal fire; and it asserts that "neither gas nor electric fires offer a completely satisfactory alternative—at least in the living rooms." "Ultimately, perhaps, electricity will become the main heating agent in residential property; but we do not believe that the open coal fire, in spite of the dirt and the labour it involves, will ever be superseded in living rooms, although its value may lie chiefly in its cheerful appearance." The word that we admire most in this confession is "perhaps."

Power Schemes.

In his third lecture on "Fuel Economy" at the Royal Institution, Professor W. A. Bone, as was seen in the "JOURNAL" last week, had something to say about the advantages, given suitable conditions, to be obtained in the way of cheap power production by the co-operation of power users with a properly organized electric power company operating over a large industrial area. He asserted that probably no other European country is so well adapted as our own for such co-operative schemes, because of the compactness of our great industrial areas, the density of their population, and their proximity to the coal-fields. We may take it that, when Professor Bone says "given suitable conditions," and then proceeds to take the North-East Coast power scheme as an illustration, he adopts it as being the standard of "suitable conditions." If so, then other areas in the country will not stand an equally good chance; for the north-east one is the *ne plus ultra* of "suitably" conditioned areas. If the history of large area electric power schemes in this country is examined, it will be found that commercial successes are rare, and that the results of the work have been heart-breaking all along for the promoters. But Professor Bone is on fuel economy; and he finds that the surplus gas of coke-oven and blast-furnace plants is not being put to the best use; and this is supplemented by an amount of waste heat and exhaust steam. Incapacity to utilize these sources of energy and indifference account for considerable loss. Here, then, is the chance for co-operation between producers and those requiring power to form companies for turning all this into electrical energy. It seems to us (as has been the case of the Yorkshire Company) that this is a matter for existing power companies; inasmuch as it is hardly likely that, where power companies have already statutory powers, Parliament would grant fresh ones to new companies. The North-East Coast Company, who use waste gases under boilers for the production of steam, which is employed in steam-turbines (acknowledged to be the most economical power producers so far invented for large unit working), are described in the lecture as a "splendid example" of what may be achieved in this way. "In short, the scheme is a triumph of engineering skill, commercial enterprise, and scientific organization, which probably cannot be matched in any other area in the world." We agree, in view of the incomparability of the area.

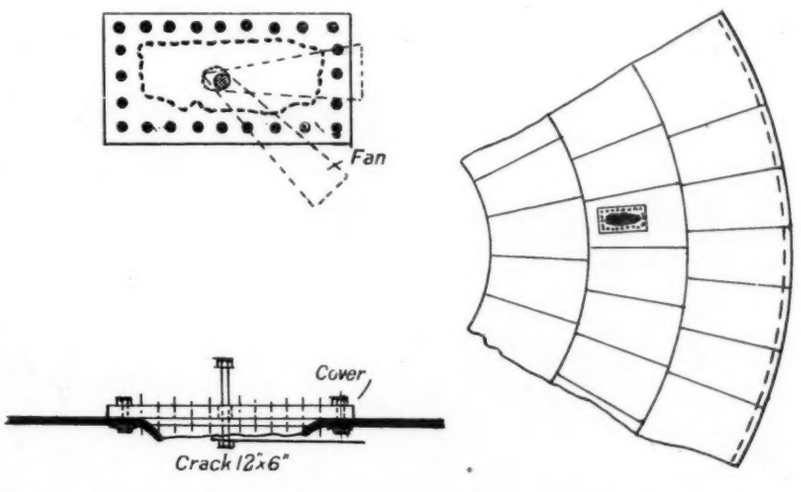
REPAIRING A DAMAGED GASHOLDER.

By K. MARTENS, Manager of the Skiens (Norway) Gas-Works.

A COUPLE of months ago a gasholder belonging to the Skiens Gas Company was damaged by careless blasting operations on a new line of railway running about 300 yards from the works. Having noticed in the "JOURNAL" for June 29 last, an article dealing with the repair of a damaged gasholder in Flanders, the author has prepared a short account of the mode of repairing his own holder, which possibly may interest readers.

Well, then, during the blasting operations referred to a rather heavy stone was flung right on the top of the holder, which has a capacity of some 30,000 cubic feet. The force of the impact made a rent in one of the sheets, about 12-inch by 6-inch—the stone rebounding and sliding off the top to the curb, where it remained. The noise and the alarming sinking of the holder at once brought out the men, and one of them got on the top, where he sat down on the rent until some plank ends and a couple of sacks could be rammed in the rent.

Then a cover was made of ¼ inch plate, and holes were drilled along the edges for the bolts. These holes were then marked off on the holder plating and drilled through. Wooden pegs were put in to stop the gas from escaping as the drilling went on. To insert the bolts from underneath, the hole had to be uncovered, and an arm inserted to push up the bolts. While this lasted, the gas was kept back by a piece of soft leather fastened round the arm and held down round the edges by the other men. To avoid opening the hole for each bolt, the bolts were hung down the hole, fastened like beads on a string, so that the man working could take one after another. When all the bolts had been pushed in, they were held up by a piece of string run round them on the outside. The arm was then taken away, and the cover plate carefully laid on. It was the work of a few seconds only to get each bolt to slide into its hole; and as soon as the plate had settled down on the red-lead packing, the nuts were put on, and the screwing-down could begin. The bent-down edges of the plating had to be drawn up in position—hence the washers underneath and the great thickness of the cover compared with the top plate itself.



The idea with the fan shown in the sketches was to help push the bolts upwards. It was really hardly needed, and had, of course, finally to be dropped into the tank—a screw plug closing up the hole where the bolt had been.

The job was finished in a few hours after making the cover plate ready and sending for the bolts. The loss of gas was only about 9000 cubic feet; and the accident did not in the slightest interfere with the town supply.

Slotted holes were not used; because it would have taken a longer time to make them; and the use of washers no doubt rendered it easier to pull up the bent-down edges.

OTTO DIRECT RECOVERY COKE-OVEN PLANT
INSTALLED AT TEAMS, COUNTY DURHAM.

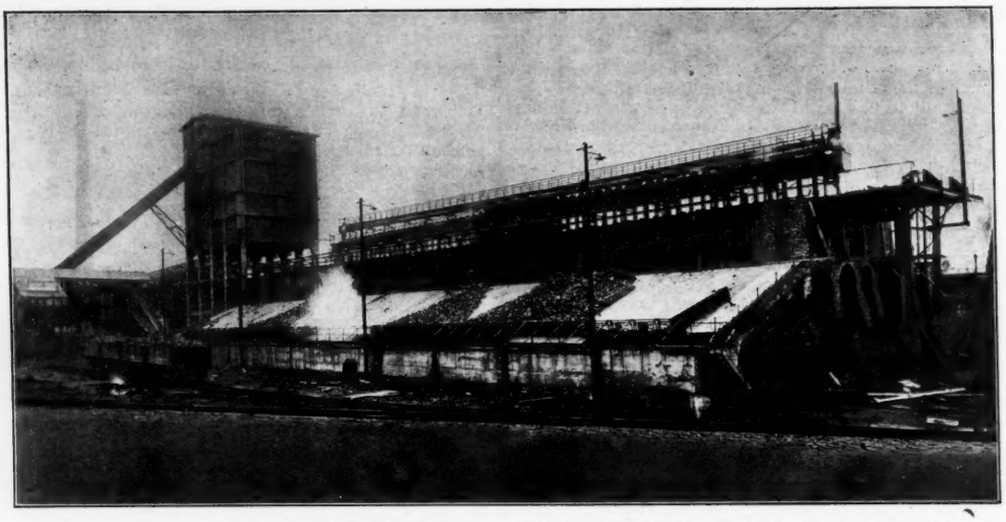


FIG. 1.—BACK VIEW OF BATTERY OF OVENS, SHOWING COAL-BUNKERS AND THE SLOPING BENCH ON WHICH THE DISCHARGED COKE IS QUENCHED.

THE accompanying photographs are of the Otto direct-recovery coke-oven plant that was recently put into operation at Teams (co. Durham), which was described by Professor William A. Bone, D.Sc., Ph.D., F.R.S., in his second Royal Institution lecture on the "Utilization of Energy from Coal," delivered on the 27th ult. [*ante*, pp. 253-56]. It was pointed out by Professor Bone that this is one of the most up-to-date plants, and that upon its design and installation very great chemical and engineering experience has

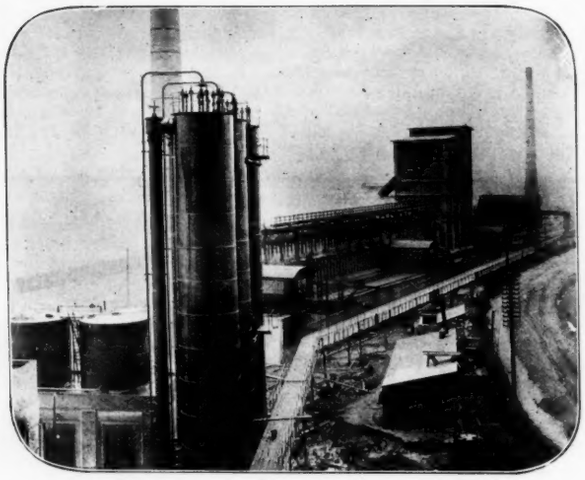


Fig. 2.—General View, showing Coal-Bunkers, Two Batteries of Ovens, with Electric Discharging Rams, and Benzol Tower Scrubbers.

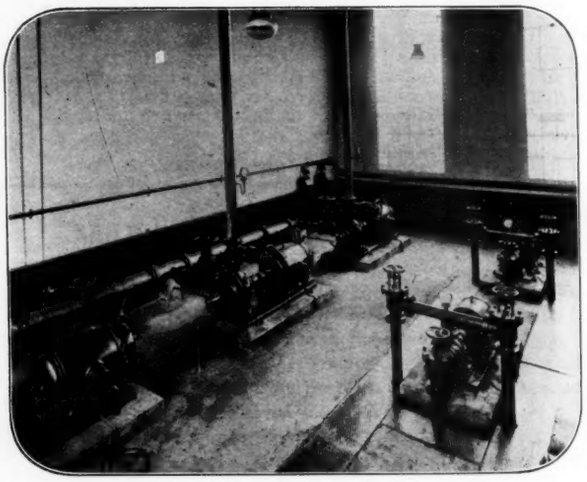


Fig. 3.—Interior of Pump-House, showing Pumps for forcing Hot Tar under Pressure into the Tar-Extractor.

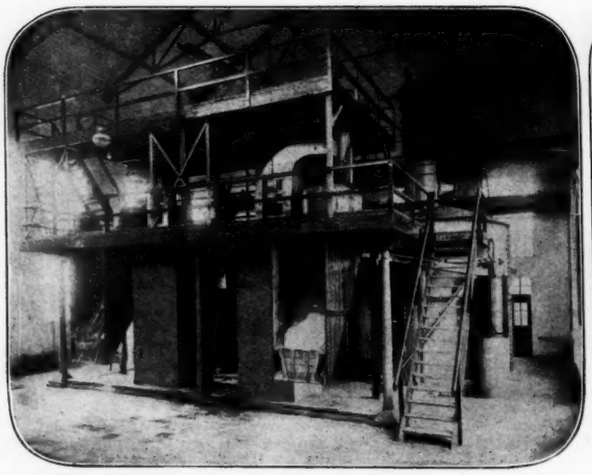


Fig. 4.—Interior of Sulphate-House, showing the Saturator in the Background, and the Arrangement for Discharging the Ammonium Sulphate from the Centrifugal Dryer.

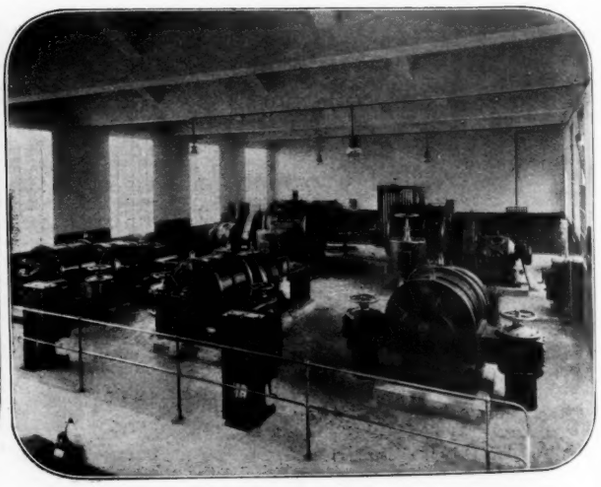


Fig. 5.—Interior of Exhauster House.

been expended. There are two batteries of sixty ovens each; the ovens being about 30 feet long, 7 feet high, and 20 inches wide. The crushed coal is charged into the oven through openings in the crown, from small hoppers which carry it on rails from the storage bunkers. When carbonization is concluded, the coke is discharged by electrically driven rams on to a sloping bench, and quenched with water. The hot crude gas, after passing through the hydraulic main, traverses in succession a long horizontal pipe and an atmospheric cooler. It then goes to the tar-extractor, where it is met by a large volume of hot tar and liquor forced in under pressure. The gas, freed from tar, passes into the saturator,

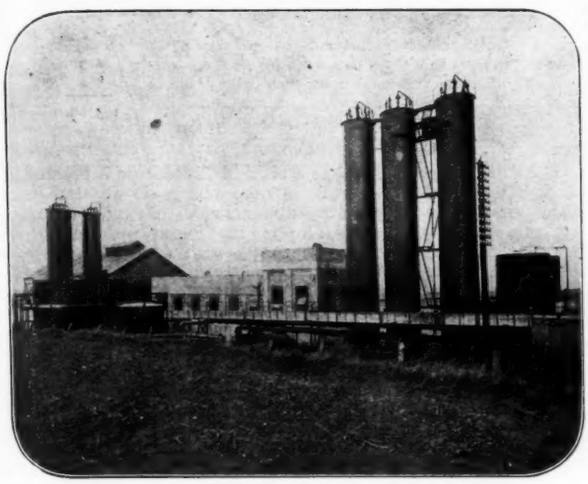


Fig. 6.—View of Naphthalene and Benzol Scrubbers.

where the ammonia combines with hot dilute sulphuric acid, forming ammonium sulphate. The sulphate passes through a receiver (where it is separated from any liquor), and then through a centrifugal dryer; while the gas goes on to the bottom of the naphthalene extractor and spray cooling tower. After this the gas is drawn through an exhauster, then through a second water-cooler (where the last traces of naphthalene are deposited), and afterwards to the benzol tower scrubbers, where it is washed with an oil which removes the benzol by a process of simple solution. On leaving the scrubbers, about one-half the debenzolized gas is returned to the ovens and used for heating purposes. The crude benzol removed from the gas is subsequently rectified in another portion of the plant.

THE GAS UNDERTAKING REGARDED AS A LOCAL AND A NATIONAL ASSET.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S., &c.

Although the old-time discontent and opposition to the gas company has long since died away, we occasionally meet with it in the person of some influential member of the local authority, who, presumably, should possess a fairly accurate knowledge of the financial and other conditions governing joint-stock enterprise, and indeed poses before his supporters as an expert on such subjects, but who nevertheless chooses to regard the parliamentary powers, dividends, &c., as valuable items of public property that have been unjustly appropriated by a body of private individuals, who have not offered or given any adequate equivalent in return. He seldom loses an opportunity of quoting the "monopoly" as something in the direction of an imposition. Even the more reasonable part of the public, who are free from political or party prejudice, or from a desire to acquire cheap notoriety by assuming the character of a guardian of the general interests, are better acquainted with the benefits secured to the gas undertaking, than with the other side of the shield. One of the useful objects so well and efficiently served by the British Commercial Gas Association might certainly take the form of some enlightenment on this matter.

If we look through the statements of account as periodically presented to the shareholders in a gas undertaking, we immediately perceive that the bulk of the expenditure, both as regards capital and revenue, is not only confined to our own country, but that a large proportion—probably not less than half—goes to the district in which the gas-works happen to be situated. The coal, iron, and fire-brick are all British products, in respect to which the enemy cannot by any possibility get a share of the trade without our knowledge. Only a few comparatively trifling accessories—such as mantles, glass, &c.—can be traced to a foreign source; and it is safe to say that these items of expenditure, small as they are, will assume more insignificant proportions in future. A prominent feature is the important share of the total outlay that is handed through the wages office pay window every week, of which nearly the whole is promptly expended in the immediate neighbourhood. A large number of shopkeepers depend upon the gas-works for the bulk of their trade; the aggregate of the wages, in the course of a year, may amount to anything between 20 per cent. and 30 per cent. of the total outlay; the buildings, gasholder tanks, and such like, will be handed to the care of a local contractor, provided a capable firm is to be met with; and the main-laying throughout the district to be supplied is dependent upon local labour.

The assessment of the gas undertaking is an important item on the ratable valuation list; and the fact that the collector's demand notes amount to 5, 6, or even 7 per cent. of the gross income, and that frequently as much as 30 per cent. of the actual profit goes to the relief of the local rates, should especially be more widely known and appreciated in the district, as it is difficult to find any other manufacturing industry that is "touched" in this respect to anything approaching an equal proportion. In the course of a presidential address delivered to the Institution of Gas Engineers in 1907 [see the "Transactions" for that year, p. 56] Mr. Charles Hunt quoted a list of about two dozen ordinary ratepayers, showing their annual turnover or gross income, their annual payments to the rate collectors, and the ratio between the two items. About half of them are below 1 per cent., and only five exceed 2 per cent. Gas undertakings can therefore claim that they pay in threefold proportion, as compared with the average ratepayer.

Sometimes a contention is advanced to the effect that an excessive assessment on the gas undertaking is nothing more than fair, as being in the nature of a *quid pro quo* for the privileges peculiar to the monopoly, or to the use of the public highways. But there is nothing in the nature of a monopoly of the roads. The gas undertaking accepts the full responsibility, and pays the full cost of any damage caused, or repairs necessitated, by their operations; and the value of the monopoly is considered in connection with numerous obligations and restrictions in respect to price, quality, supply, pressure, purity, and profits.

The dividends distributed to the shareholders are for the most part spent in the district, or, if this is not the case, the blame cannot be laid at the door of the gas company. Local capitalists, small or large, have only themselves to thank if they do not avail themselves of the opportunity of obtaining a sound, excellent home investment, that the law of the land has placed within their reach by means of the "Auction Clauses" that are invariably attached to the regulations governing the issue of new capital. In the ordinary way, a large number of gas-works' employees, users of gas, retired tradesmen, and others having funds to invest, are glad to take up securities of this nature.

The author claims to have shown that a very appreciable part of the gross income received by the gas undertaking is returned to the district where it is raised, in the form of wages or salaries, several other items of expenditure, rates, and profits, and that the concern is in no sense a financial vampire, taking a large sum of money out of the district, and affording no benefit in return.

That the gas undertaking occupies a very important position, regarded as a national asset, is strikingly evidenced by events during the last eighteen months. In the first place, it has provided men excellently fitted for military service. The keen and discriminating eye of the recruiting sergeant has not failed to notice, and appreciate the value of, the sturdy specimens of humanity that are to be seen passing through the gas-works' entrance gates, at the meal hours, or the time for changing the retort-house shifts—men whose habitual arduous physical exertion, regular exposure to wide extremes of temperature and to all conditions of weather, punctual attendance to duty at fixed hours, and strict obedience to established rules have eminently fitted for active military service under widely varying conditions of climate. The Gas Light and Coke Company head the long list with the very respectable figure of 2600; and, with few exceptions, every gas-works in the country has furnished an adequate number of men, frequently amounting to 30 per cent. and upwards of the total number on the pay sheet.

Accounts of the award of the V.C. and other high military honours to men who left the gas-works at their country's call that appear weekly in the columns of the "Journal" go to prove that the quality is as good as the quantity. Engineers, managers, and others holding responsible positions as the heads of departments, men possessing a high degree of technical training and experience in the control of large numbers of workmen, have formed a valuable acquisition to the ranks of commissioned officers and to the more skilled branches of the military service, such as engineering, signalling, &c. If the entire population of the country had followed the lead of the gas industry, there would be no difficulty in meeting the fullest requirements of Lord Kitchener, or necessity for discussing conscription and other drastic measures for raising recruits; while the ladies of the "White Feather" persuasion would find little scope for the exercise of their activities.

As regards the sin of national waste, due to the consumption of coal in the raw state, now being so eloquently and forcibly advocated by Professor W. A. Bone, the gas industry can enter a plea of "not guilty" in respect to the 20 per cent. of the total quantity of coal raised, that finds a sepulchre in the gas-works retort. A large quantity of ammonia, benzol, phenol, sulphur, and toluol are secured, together with other products that at ordinary times are valuable market commodities (necessitating the employment of considerable numbers of workers of various grades, including some of a high order), but at the present time are indispensable to the successful conduct of modern war. Also some 50 per cent.

of the weight of the coal carbonized is returned to the market in the form of coke—a fuel that practically displaces and sets free for other uses its own weight of coal. One can scarcely give an accurate idea of the further large quantity of coal that is displaced by the extensive use of gas for cooking, warming, and other fuel purposes. As in the example above cited, the coal is not lost to the community; but when the gas undertaking takes with one hand, it gives back with the other.

The financial assistance afforded by the investment of reserves of accumulated profits in war loan funds, and the income-tax paid on the full amount of profit earned, whether divided or not, is a valuable national asset; and the columns of the "JOURNAL" abound with details of the multifarious ways in which gas is assisting the production of munitions and other sinews of war, and meeting the requirements of temporary camps, hospitals, &c. To use the stock phrase of the day, gas undertakings and the gas industry are effectively "doing their bit."

FUEL VALUES.

By Dr. J. H. PATERSON.

[Extracts from a Paper read before the Newcastle Section of the Society of Chemical Industry.]

The last issue of the "Journal of the Society of Chemical Industry" contains the text of a paper read on Dec. 15 dealing with the financial value to the consumer of various fuels—coal, coke, producer gas, oil fuel, coal gas, and powdered coal.

The author pointed out that this value must be measured by the amount of heat to be obtained by the expenditure of a definite amount of money, which is totally distinct from, and is not affected by, the quantity of the available heat which is utilized in any given process. In the paper, therefore, no cognizance is taken of the methods and appliances used to obtain the most efficient utilization of the heat generated, but only the amounts of heat actually available from the fuel used.

In dealing with fuels of different classes, some difficulty was met with in finding a common unit of value for their comparison; and it was considered best, for the purposes of the paper, to make this unit the number of heat units (B.Th.U.) obtainable for 1d., after all the costs of handling the fuel and causing it to burn had been added to the price per ton. This number is referred to hereafter as the "absolute heat value" of the fuel in question.

As the cost of fuels varies considerably in different parts of the country, the comparison of their values is impossible unless the prices of all the different classes considered are those ruling in the same locality. For the purpose of the paper, therefore, the prices given were an average of those ruling in the North-East Coast industrial centres. As the present cost of fuels is in all cases abnormally high, and in some cases (foundry coke and oil fuel) out of all proportion to the usual value, pre-war prices and values are shown in the most important cases as well as the present prices and values.

COAL.

It is, the author points out, very generally recognized that the less money one pays for coal the more incombustible matter (water and ash) it is liable to contain. But it is by no means so generally realized that the absolute heat value increases rapidly as the price decreases. Table I., which is compiled from the average analysis of a few selected coals of types in common use, shows this clearly. In the table the calorific values are the net values—that is, the calorimeter value as determined on the dried coal, less the amount of heat carried away as latent heat, during combustion, by the steam produced. The price of the coal as quoted includes the cost of delivery into the works; this cost averaging about 2s. per ton.

TABLE I.

Class of Coal.	Price per Ton.	Net Calorific Value. B.Th.U.	Incombustible Matter. Per Cent.	B.Th.U. for 1d.	A.H.V.
1 Best screened loco. coal .	23s.	14,280	5·6	115,000	98,700
2 Screened steam coal . .	18s. 3d.	13,120	13·35	134,200	110,700
3 Screened steam coal . .	18s.	13,260	10·65	137,500	113,300
4 Smith's small coal . . .	18s. 6d.	13,600	10·32	137,000	115,500
5 Unscreened steam coal .	17s. 6d.	13,135	12·25	140,000	114,400
6 Washed small coal . . .	15s.	12,780	12·50	153,500	126,100
7 Heap coal	8s.	10,040	29·3	222,000	136,200

The author introduces a curve plotted to show the heat units per ton for a large number of coals against the price paid per ton. The curve is remarkably regular; and from it it is evident that (for prices between 14s. 6d. and 18s. per ton) if the coals were sold on a regular calorific scale, instead of following the laws of supply and demand, one would expect to pay less than the present market value between the limit of prices named. The coals in this area of price included unscreened steam coals, washed slacks, and small nuts, all of which are among the most commonly used classes in large works. A similar curve constructed by the author at the end of 1913 shows the falling off in value that occurs between the prices of 8s. 9d. and 11s. 9d.

Tables II. and III. show how the absolute heat values of coals Nos. 2 and 7 in Table I. are arrived at. The figures given are those obtained when these coals are used to heat a frame-bending furnace and are very similar for a hand-fired boiler.

TABLE II.—*Coal No. 2.*

One ton of coal has a net calorific value of 29,344,000 B.Th.U.

Coal at 18s. 3d.	219d.
Firing labour	36
Moving coals and clinker	8
Repairs to grates	2
	265d.

A.H.V.=110,700.

TABLE III.—*Coal No. 7.*

One ton of coal has a net calorific value of 22,489,000 B.Th.U.

Coal at 8s.	96d.
Firing labour	38
Moving coal and clinker	20
Repairs to grates	4·5
Steam for blowing	6·5
	165·0d.

A.H.V. = 136,200.

COKE.

Coke of all classes requires a blast of air to keep it burning at a high temperature; so that, in determining its absolute heat value, the cost of this blast must be included. Foundry coke has recently reached so abnormal a price that its heat value as shown is misinforming. Its value in 1913—see Table VIII.—gives a better idea as to its true relative position. Coke breeze (coke refuse from gas-works) is not, the author says, always appreciated at its true value. The breeze when screened through a screen of ¼-inch mesh loses 40 per cent. by weight of fine dust, and leaves a residue of coke nuts which is an excellent fuel for many purposes. Previous to the war it paid to throw away the 40 per cent. of dust; but now that its price has risen, it becomes worth while to briquette it and mix the briquettes with the screened breeze—the cost of briquetting being 5s. per ton of screenings, including labour and tar binder, and also interest on capital.

Tables IV., V., and VI. show how the absolute heat values of foundry coke, screened breeze, and the mixture of screened breeze and briquettes are obtained. In Table V. the screenings from the breeze are assumed to be worthless and thrown away.

TABLE IV.—*Foundry Coke.*

One ton of coke has a net calorific value of 30,350,000 B.Th.U.

Coke at 32s.	384d.
Firing labour	36
Moving coke and clinker	9
Repairs to grates	2·5
Blowing	3·5
	435·0d.

A.H.V. = 70,000.

TABLE V.—*Coke Breeze (Screened).*

One ton of breeze has a net calorific value of 29,120,000 B.Th.U.

Breeze at 10s.	120d.
Cost of screening	13
Moving coal and clinker	9
Firing labour	36
Repairs to grates	3
Blowing	4
	185d.

A.H.V. = 157,400.

TABLE VI.—*Coke Breeze (Briquetted).*

One ton of breeze has a net calorific value of 29,120,000 B.Th.U.

Breeze at 6s.	72d.
Briquetting 40 per cent.	24
Firing labour	36
Moving coal and clinker	9
Repairs to grates	3
Blowing	3
	147d.

A.H.V. = 200,000.

PRODUCER GAS.

The absolute heat value of producer gas depends mainly on the first cost of the coal and on the efficiency of the type of producer used. The results recorded were obtained from a battery of water-sealed producers of the Duff type, each producer being capable of gasifying 10 tons of coal per 24 hours. The coal used in them was the small coal No. 6 in Table I.

A cubic foot of the cold producer gas has a net calorific value of 170 B.Th.U.; and 65 cubic feet of cold gas is produced per pound of coal, or 145,600 cubic feet per ton. One ton of coal therefore gives cold gas equivalent to 24,750,000 B.Th.U. When, however, the gas is used hot (as from the producer) the sensible heat of the gas raises this quantity to 27,000,000 B.Th.U. As the original heat value of the coal was 28,627,000 B.Th.U., this shows a loss in the producer of 5 per cent. of the available heat. The absolute heat value is arrived at as shown in Table VII.

TABLE VII.—*Producer Gas.*

One ton of coal produces gas with a net calorific value of 24,750,000 B.Th.U.

Coal at 15s.	180d.
Labour.	37
Steam	13
Moving coal and clinker	8
Repair and upkeep	2
Interest on capital	6
	246d.

A.H.V. of cold gas = 100,600.
" hot gas = 110,660, or 10 per cent. more.

It may be argued that a somewhat expensive coal has been chosen when calculating this absolute heat value, and that if a cheaper coal were burned in the producer, the values shown would be greater. Experience shows, however, that this is not the case, as with the stationary type of producer there is a limit to the ash content of the coal, beyond which good results are impossible. As an example, in the same producers a small dusty coal was tried with the following results: The cost of the coal was 11s. per ton, and its heat value 26,150,000 B.Th.U. net per ton. The loss in the producer was 12 per cent., and the heat value of the cold gas per ton of coal 23,000,000 B.Th.U. net. The cost of working the producer, supplying steam, and repairs to the plant amounted to 112·5d. The absolute heat value of the cold gas was 98,500, and of the hot gas 108,500. The heat value is therefore 2 per cent. less than with the dearer coal; and the dissatisfaction among the firemen being taken into account, it will be seen that the cheap coal does not by any means produce cheap gas. Mechanical producers do away with the labour and other troubles enumerated; but, owing to their comparatively short life, increased first cost, and increased upkeep, their advantages are not very obvious—in the Newcastle district at any rate.

Oil Fuel.

Within the last twelve months the cost of fuel oil of moderately good grade has increased by nearly 100 per cent. This therefore puts an always expensive fuel almost out of consideration. Good Texas oil of about 1000 seconds viscosity has a net calorific value of about 17,300 B.Th.U. per pound, or 38,750,000 B.Th.U. per ton. This oil now costs 105s. per ton. Before it can be burned in a furnace, it must be first atomized, either by compressed air or steam, or else blown through a special nozzle at high pressure into a forced-draught furnace. The cost of vaporizing oil by compressed air is 10s. per ton of oil, and by steam or high-pressure feed 6s. per ton. The absolute heat value is, therefore, obtained as follows: One ton of oil at 105s., 1260d.; steam, 72d.; handling oil, 8d.; interest on capital, 1·5d.; total, 1341·5d. Thus the absolute heat value is 29,000.

Coal Gas.

Ordinary town gas averages about 510 B.Th.U. net per cubic foot. It may be obtained at about 1s. 7d. per 1000 cubic feet in most large centres. As there is no labour or upkeep of plant to consider, unless compressed air is used, the absolute heat value works out at 27,000.

Powdered Coal.

Within recent years a method of burning coal by grinding it to a fine powder and blowing the powder into the combustion chamber by means of a stream of hot air, has received considerable attention. In the cement-making industry its application has been highly satisfactory, and its use has resulted in great economies. As applied to boiler and metal furnace firing it has, however, met with little success—owing partly to want of experience in its use, and partly to the cost of grinding and handling the powdered coal. Its absolute heat value when determined for coal (No. 6 in Table I.) is as follows: Cost of coal, 180d.; cost of grinding and blowing in the coal, 46d.; labour, 30d.; repairs to plant and renewals, 4·5d.; interest on capital, 6d.; total, 266·5d. Hence the absolute heat value is 107,300.

The Fuels Contrasted.

Table No. VIII. shows the absolute heat values of all the fuels considered, tabulated in their present order of magnitude. It should not be imagined that the figures will determine the most economical fuel to use in any given operation, as it is possible to utilize in some cases more of the available heat from one fuel than from another. Thus, by employfng producer gas for furnace-heating, it is possible to use efficient regenerators, and thus recover a large proportion of the heat usually passed up the chimneys.

Table VIII.

Fuel.	Absolute Heat Value.	
	1915.	1913.
Coke breeze and briquettes	200,000	215,700
Coke breeze (screened)	157,400	232,900
Pit heap coal	136,000	140,000
Washed small coal	126,000	175,000
Screened steam coal	110,700	161,000
Producer gas (hot)	110,660	160,000
Coal powder	107,300	..
Foundry coke	70,000	140,600
Oil fuel	29,000	41,000
Town gas	27,000	30,000

As the saving in heat thus made possible is sometimes very great, the difference in the heat values of producer gas and small coal may be so far overcome as to make it economical to use the former. Again, while coal gas is shown to be highly uneconomical, it may be used for small operations with the utmost success, as the time and trouble saved in starting-up (say) a tool-hardening furnace heated by gas, more than counterbalances the increased cost of the fuel.

The Manchester District Institution of Gas Engineers will hold their annual meeting on Saturday of next week, when Mr. E. A. Harman will deliver his Presidential Address, and Mr. Henry Simmonds, of Bury, will read a paper on "Naphthalene."

PILOT FLAME IGNITION OF INCANDESCENT GAS-LAMPS.

By C. W. Jordan.

[A Paper read before the American Illuminating Society.]

The subject of pilot flame ignition of incandescent gas-lamps may appear to many to be rather a minor or unimportant detail of the broad general subject of gas lighting; and yet, on analysis, it will be found to be extremely vital for the successful operation of lamps in practice.

Convenience in gas lighting has become a necessity; and many devices have been perfected for securing automatic ignition—in some cases controlled from distant points. Despite the ingenuity shown in the design and mechanical construction of these devices, for one reason or another they have not recommended themselves as competent to meet the practical requirements of service. Those which are apparently satisfactory automatically actuate a mechanism, turning on the main gas supply, which, in turn, is ignited by means of a pilot-flame. Therefore the convenience of such mechanical devices is dependent not only upon their own merits, but also upon that of the pilot.

Other devices, which do not use pilots, while ingenious, well constructed, and positive in action, owing to their high initial cost do not find wide application.

Pyrophoric igniters, self-lighting mantles, &c., are not extensively used, because of the ease with which the mechanical parts get out of order, or on account of the short life of the active material. The simple pilot bye-pass and gas-cock actuated by pulling a chain meet the demand for convenience, economy, and service in the most satisfactory manner.

This paper, therefore, will be devoted to telling the history of the use and improvement of this simple means of ignition, which depends upon the same energy or fuel that supplies the lamp itself, and which is operated by the same mechanical movement that controls the lamp. Every consideration points to this as the ideal as well as commonsense method of ignition, if it can be perfected.

Pilot Bye-Passes.

The term pilot bye-pass may be defined as a device by means of which a supply of gas is regulated and led from a point just ahead of the gas-cock of a lamp to a pilot-tip or point of discharge conveniently placed near the mantle.

The gas-cock and pilot take-off are in some cases of separate construction from the lamp and easily detachable, while in others they constitute a true part of the lamp construction. The length of the pilot-flame is regulated by turning a small screw which moves in or out of a constriction in the passageway leading to the pilot-tip. In some instances, lamps are equipped with so-called "flash pilots." A flash pilot may be defined as one in which the pilot momentarily elongates during ignition and shoots across the top of, or into, one or more mantles of the lamp.

The means for successfully accomplishing this are several. In one lamp a secondary cock is connected to the primary gas-cock so that, upon pulling the chain to light the lamp, it is turned 180°, and the gas passes through to the pilot-tip at unrestricted pressure—bye-passing the ordinary regulating screw. Another device consists of an additional passageway bored in the gas-cock, which on being turned on supplies gas at unrestricted pressure through a small tube—bye-passing the regulating screw. When the cock is turned on full, the passageway in the gas-cock is no longer opposite the passageway leading around the regulating screw; and the gas to the pilot is supplied only through the usual regulating screw.

Flash pilots are effective, especially in arc lamps, in that they secure more positive and softer ignition of all the mantles.

Pilot Tips.

Little trouble has been experienced in constructing efficient means for regulating and conveying the pilot gas supply to the point of discharge; but the construction of a satisfactory pilot-tip, especially for inverted lamps, has been very difficult. The main troubles encountered are: (1) Carbon formation; (2) clogging of the tip, due to disintegration of the gas, &c.; (3) the ease of extinguishing the flame by draughts.

With upright lamps a plain metal tube of small diameter, placed properly in a vertical position, burns satisfactorily; but the flame is easily extinguished if the lamp is subjected to excessive draughts. A centre pilot was then designed, which consists, briefly, of placing the pilot-flame directly above, and in the centre of, the burner cap gauze—thus utilizing the mantle as a means of effectively protecting the flame from draught. The construction of a centre pilot bye-pass is shown in fig. 1 (p. 362).

With inverted lamps it was necessary to use pilot tips made of lava or other refractory material, in order to overcome the common troubles before mentioned. Lava pilot tips have undergone decided changes, both in the principle upon which they operate and in design. The first type consisted of a simple passage, drilled through the tube, and having a side outlet for discharging a luminous flame horizontally. A pilot-tip was then developed which gives a blue bunsen flame while burning. The gas discharges horizontally through a small orifice into a mixing tube provided with two air inlets. When operating at normal consumptions—between 0·1 and 0·15 cubic foot per hour—a perfect

bunsen flame is obtained, which is extinguished by draught with far greater difficulty than the luminous flame pilot, and has the additional advantage of eliminating troublesome carbon formation or smoky flame. Changing the position of the primary air inlets from a vertical to a horizontal position was found to render the pilot appreciably more resistant to draughts.

Fig. 1.—Centre-Pilot Burner.

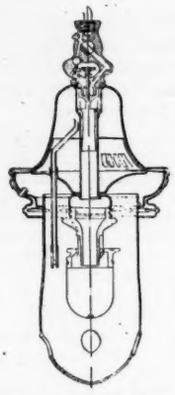


Fig. 2.—Vertical Pilot Tip.

In the early development of the bunsen flame pilot, a series of unlooked-for defects was found, a description of which may be of interest. In order to obtain a true bunsen flame, it is necessary to make the orifice of very small diameter, 0·016 inch (0·40 mm.). After several hundred hours burning of the lamp, the orifices invariably become clogged. The tips were made of natural lava, baked, and on the interior a hard glossy coating of carbon, resembling flaked graphite, was found. This extended through the entire passageway to the orifice, which, on account of its small diameter, first became stopped. An investigation was made, and it was found that the decomposition of the hydrocarbons in the gas to carbon was influenced not only by the high local temperature (620° C. at the orifice), but also by the physical properties of the substance used in construction. By using a tip made of finely crushed natural lava, repressed and baked, the trouble was practically eliminated. A small amount of carbon formed in the passageways which was greyish, instead of black, and after the lamps were burned several thousand hours was found not to give trouble.

An interesting series of experiments was made, the results of which clearly illustrate the influence of the physical and chemical properties of the pilot-tip material upon the decomposition of the gas. Various substances were placed in a transparent quartz tube, through which illuminating gas was passed, and heated slowly and uniformly by means of an electric furnace. Certain substances, like metallic oxides (particularly mantle ash), became covered with carbon at a temperature as low as 260° C.; while others (like glass, quartz, &c.) only darkened at a temperature of above 650° C.

A still more recent change has occurred both in the design of pilot tips and in the position in which they burn. The pilot-tip of the lamp shown in fig. 2 is mounted vertically; and in this position the flame is very well protected from draughts, and at the same time is positive in its ignition of the mantle.

The advantages of this type of tip are: (1) There is no orifice which may become clogged with carbon from the decomposition of gas; (2) in case the pilot-flame becomes over-adjusted, there is no danger of cracking the enclosing glass cylinder; (3) when subjected to excessive draught the pilot flame retreats within the pilot-tip and is effectively protected.

Service Troubles.

Pilot devices are subject to numerous troubles in service. In certain localities the methods of manufacturing and purifying gas are liable to change suddenly from normal; and often tar particles are carried in suspension by the gas for considerable distances from the works. In this event the tar rapidly accumulates on the pilot adjusting needles of the lamps and completely closes the minute annular opening through which the gas discharges.

Fig. 3.—Tar Scrubber.

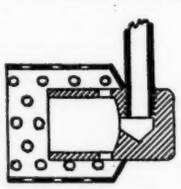


Fig. 4.—Semi-Bunsen Protected Pilot.

In order to overcome this trouble a purifying device, shown in fig. 3, was designed. Essentially it consists of passing the gas through a small cylindrical brass tube which has been packed with asbestos wool, glass wool, mineral wool, or other suitable material. The gas to the pilot-flame is completely detarred by this method for a long period. When the filtering material becomes clogged or saturated, the brass tube is removed, cleaned, and repacked. This simple device has proved very effective, and in a few instances absolutely essential for the proper working of pilots.

Pilot outage due to draughts is a condition which lamp manufacturers have been attempting to minimize and eliminate. The seriousness of the trouble is primarily dependent upon the conditions under which the lamp burns, and whether it is an indoor or an outdoor lamp.

The luminous flame pilot is far from desirable in this respect, unless it is properly surrounded by a protecting casing, in which event it is very liable to carbonize. With upright lamps the pilots can be readily enclosed by the mantle (see fig. 1), and are thus efficiently protected. In the case of inverted lamps, the problem was more difficult. Investigation led to the adoption of the bunsen flame pilot-tip, and finally in a later modification to a type which is very difficult to extinguish (fig. 2).

With outdoor lamps the use of semi-bunsen pilots, surrounded by a protecting casing (fig. 4), has proved very satisfactory.

Radical changes in the construction of pilot tips, being experimented with at present, give promise of producing a practically inextinguishable pilot in the near future.

Pilot Consumption.

A consideration of the consumption of gas by pilots is of importance, in that consumers are often badly misinformed or entirely ignorant of its magnitude. The consumption is not only influenced by the length of flame which is judged adequate by the adjuster, but also upon the particular type of pilot bye-pass used.

The so-called "sub-flame" pilot bye-pass is, in reality, a simple device for turning low a gas-lamp. As the flame must burn over the entire surface of the burner gauze without danger of flashing-back, the consumption is naturally greater than that of an ordinary pilot.

The use of the "sub-flame" pilot bye-pass is rather limited, and the pilot consumption should not be taken as representative of the more efficient types.

The following table shows the normal consumptions of various types of indoor and outdoor lamps, and the ratios of the total gas consumption to that of the pilot consumption.

Lamp.	Normal Pilot Consumption per Hour (Cu. Ft.)	Approx. Length of Flame (Inches).	Pilot Consumption per Year (Cu. Ft.)	Normal Lamp Consumption per Hour (Cu. Ft.)	Lamp Consumption per Year Four Hours Daily. (Cu. Ft.)	Pilot Consumption per Cent. of Total Consumption.
One-burner inverted indoor, bunsen pilot	0·120	¼	1051·2	3·50	5,110	17·1
One-burner upright indoor, luminous pilot	0·095	¼	832·2	4·65	6,789	10·9
Three-burner inverted indoor arc, semi-bunsen pilot	0·147	⅜	1287·7	10·00	14,600	8·1
Five-burner inverted outdoor arc, semi-bunsen pilot	0·213	½	1865·9	17·50	25,550	6·8
One-burner inverted outdoor, luminous pilot	0·152	⅜	1331·5	3·45	5,037	20·9

These calculations are made on the assumption that the lamps operate on mixed gas at 2·5 inches pressure. Total heat value 650 B.Th.U. per cubic foot; sp. gr. ·660.

Novel Use of Blue-Flame Pilots.

As mentioned before, the essential reasons for changing from the luminous flame to the non-luminous bunsen flame pilot were because of the greater difficulty of extinguishing the flame of the latter by draughts, and the elimination of troublesome carbon formation or smoky flames.

In addition to these features, the non-luminous flame lends itself to a novel and efficient use. It has long been contended that the luminous flame pilot, instead of being considered a necessary expensive accessory of a gas-lamp, is in reality an efficient adjunct, in that it serves the purpose of guidance to the consumer desiring to turn on a lamp in a dark room. By placing the bunsen flame pilot so as to impinge on the mantle to the extent desired, an increase in the intensity of light of over five times that of the luminous flame pilot is obtained.

The following table shows the maximum horizontal candle power obtained from the two types of pilot flames:

Type of Flame.	Maximum Horizontal Candle Power.	Corrected Consumption Cu. Ft. per Hour.	Horizontal Candle Power per Cu. Ft.
Bunsen flame	0·1612	0·126	1·28
Luminous flame	0·0319	0·130	0·245

Open-flame candle power of gas burned in 8 feet tip, 22 at a 5-feet rate.

The increase in intensity not only serves as a better guidance in turning on the lamps at night, but to the dark adapted eyes it affords sufficient illumination to comfortably distinguish many

objects in an ordinary living-room. This is obtained at a cost no greater than that of maintaining the luminous pilot-flame. In addition, it is more difficult to extinguish the flame of a pilot impinging on the mantle.

In cases where pilot illumination would be objectionable, it is merely necessary to turn the pilot-flame aside from the mantles, and practically no light is obtained.

A PROGRESSIVE BUSINESS.

Some seventy years ago, in the interesting old town of Brixham (situated on the promontory that shelters the very picturesque Tor Bay on the south-west side, and is famous for its fishing industry and for its iron ore mines and deposits), a Mr. Calley, who lived in a house in the New Road, started to build some fishermen's cottages on his adjacent property. But while in the course of making the foundations, he came across a deposit which, on examination, was found to be a natural ferric oxide of such peculiar properties that, when converted into paint and applied to wrought iron, it filled up the interstices and formed an integral part of the metal, and thus materially assisted in preventing corrosion and decay. He immediately stopped erecting cottages, and, in fact, turned those that were already built into a factory for the making of paints, which he designated "Calley's Torbay and Chemical Paints," and registered the trade mark of William of Orange stepping out of a boat on to the shore at Brixham (where he first set foot in England), using his expression "I will maintain" for his motto. To this day, the original factory can be seen among the various buildings in the New Road Works; while the original deposit has been extended, and mines are now worked for the excavation of oxide of iron, from which the present Torbay Paint Company derive their name as well as their registered trade mark "Torbay Paint."

This iron oxide, which is practically inexhaustible, is found in pockets that are of a volcanic nature, and may be exploited near the surface or as far down as 100 feet below; and it was probably formed by the percolation of the water running from the iron ore and being caught in these pockets. Upon being brought to the surface, it is taken to the washing works, where it is thoroughly pugged and run through a series of troughs, to take away all impurities and leave the pure oxide, which is then run through filter-presses under heavy pressure. The next process is to convey it to the drying-room, where all moisture is extracted; and it is then put through the grinding-mills, where 28-lb. cannon balls grind one against the other, and air is forced in underneath, which takes the minute particles up through a canvas trough into a chamber, where it is allowed to settle, when it is found almost silk-fine. The colour of the oxide is brownish, and is almost identical with the shade shown in the Company's new catalogue as their "No. 1 Brown." To obtain other shades, the oxide is calcined in retorts to a shade of red, and also to a black; so that when mixed with zinc oxide innumerable shades of colour can be obtained.

When the Company first started, they confined themselves to making four shades; but at the present time they have over a hundred standard shades, and it is possible for them to match any particular shade with reliability. They were the pioneers in the making of light shades from oxide of zinc in combination with oxide of iron—thus forming a paint which is non-poisonous and innocuous to the worker, whereas paint made from a lead base often produces colic or plumbism. The Company were also one of the pioneers in the enamel trade and varnish stain for wood floors. There is only one quality of "Torbay Paint;" and it is prepared specially for every class of work—attention being given to the manipulation of the oil medium to obtain the best results for under-coating and finishing. The Company emphasize the fact that the first or priming coat is the most important part of a painting operation, and has to fulfil a dual object, in that it must fill up the interstices in the surface of the material it has to protect and ensure perfect adhesion for the subsequent preservative coatings. The paint is extremely finely ground, by the aid of powerful machinery; and each colour is standardized according to weight, and has to pass through a very fine mesh before being sent to the customer.

It is interesting to note that the present partners in the firm (who have extended their ramifications all over the world, and made the name of "Torbay Paint" a standard to which engineers and others work their specifications) are Mr. Edward Stevens, who has been associated with no less than nine partners during his life, and whose two sons are at the head of the manufacturing departments, Mr. S. Freeman Burrows, and Mr. H. L. P. Allender.

At last week's meeting of the Society of Engineers, the premiums awarded by the Council for papers read during 1915 were presented as follows: The President's Gold Medal to Mr. Arthur H. Barker, B.A., B.Sc., for his paper on "Future Developments in Heating and Ventilation." The Bessemer premium (value £5 5s.) to Mr. Alphonse Steiger for his paper on "The Modern Development of Water Power." The Society's premium (value £3 3s.) to Mr. Sydney G. Turner, Assoc.M.Inst.C.E., for his paper entitled "Law and Engineering—Some Points of Contact." All three papers were noticed in the pages of the "JOURNAL" at the time they were read.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Calorific Standards in England and the United States.

SIR,—We have read with great interest the editorial comments in the "JOURNAL" for Sept. 28 last, on the paper presented by our Mr. M'Bride at the International Gas Congress. This editorial and a number of other items which from time to time have been printed in the British gas journals raise a question in our minds which is, we believe, of considerable importance.

The problem of a selection of the proper heating-value standard for gas is, as we view the question, primarily an economic problem. It is highly desirable that the customer should secure the largest measure of useful energy for each dollar of cost to him. Starting from this assumption, which we believe is unassailable, it becomes a question of determining the amount of useful heat which can be made available to the user of gas for each dollar of cost, since in general we must employ the unit of useful heat as the measure of service rendered.

The question which we would like to ask of British engineers is this: Does the very low heating value per cubic foot which is permitted under standards for gas quality in Great Britain operate to the advantage of the customer, or would the customer and the company be better cared-for if the quality might be increased (say) by 5 or 10 per cent. with a corresponding increase in the price charged for gas? We would like to address to a number of the best informed engineers of your country the following question: Would you prefer to deliver gas of (say) 5 or 10 per cent. greater heating value per cubic foot if you could secure for such gas an increase in price of 5 to 10 per cent.? We will be glad to have you refer this inquiry to a number of prominent engineers personally or give us the names of such engineers as you believe could best answer the questions presented.

We would have it understood that the Bureau of Standards is perfectly willing to advocate a much lower heating value standard than that which now prevails in the United States, if thereby better service to the users of gas can be ensured. However, with the data which have been presented to the Bureau up to the present time, we are unable to conclude that a marked reduction in gas quality would thus serve the public interests. When we have assumed an adequate percentage of return on the necessary investment of the companies, and a reasonable allowance for maintenance, depreciation, and all operating expenses (including taxes for each of several qualities of gas), we have failed to find in any case yet studied any material advantage in favour of gas qualities below 575 to 600 B.Th.U. per cubic foot. On the other hand, in a number of cases investigated, the data seemed clearly to indicate that the advantage to the customer lies rather with the higher quality of gas. In contradiction to this generalization, we have frequently presented to us the arguments that British conditions demonstrate that our position and conclusion are not correct.

We have read with interest numerous articles which have been presented on this subject by British engineers, but have not been satisfied as to the correctness of this statement which is made to us. It is because of this difference of opinion, which appears to exist not only in the United States but in your country, that we address you at this time in the hope that further valuable suggestions may come to us, and perhaps that an exchange of opinions between the United States and your country may be profitable to both.

S. W. STRATTON, Director,
Department of Commerce—Bureau of Standards.

Washington, Jan. 7, 1916.

[This letter, the publication of which has been unavoidably delayed, is dealt with in our editorial columns to-day.—ED. J.G.L.]

Lighting of Railway Trains.

SIR,—With reference to the article you reproduced from the "Engineer" in the "JOURNAL" for the 1st inst., I should not like the statements to go unanswered, because they seem to favour the electric light more than is necessary. So, in the interests of the gas industry, would you insert this letter in the "JOURNAL," not so much for the information it contains as in the hope that others may be able to make useful suggestions to enable the railway companies to continue the use of gas, which is undoubtedly the cheaper form of light. In addition to certain difficulties in lighting, it will be a long time before electricity will be able to efficiently replace gas in the kitchens of the railway dining-cars; and these cars are being more extensively used every year—even on the short tracks of the British railway companies.

The great danger appears to me, not so much from the gas-lamps themselves, but owing to the very high pressure of the storage tanks; and these, being under every carriage, add considerably to the danger. I think in future it might be arranged that the gas-tanks, if not on a small separate carriage should be either on the engine tender or in the guard's van, and the pipe-connections for the lamps on the carriages connected up by flexible tubes which for high-pressure gas might be about one-quarter of the size used for the vacuum brakes, and therefore more readily joined-up than these connections. This being so, any serious accident would probably sever them, or arrangements could be made, if thought desirable, that they would undoubtedly be disconnected, and by some special contrivance the gas could be retained for reconnection as soon as it was considered advisable to do so.

Having a universal pipe connection for all the carriages, the supply could readily be arranged to be under the control of either the engine-driver or the guard. This would be another safeguard in the case of accident, and again would very much add to the economy of the gas for trains that are at present lit simply for the sake of a few tunnels. In such cases the lights are now frequently turned on long before it is necessary, being more convenient to light up before the train starts from the station than when it is actually dark.

Other advantages of the gaslight being under the control of the officials running the train would be apparent. In the event of aërial

raids on the districts the trains are running in, instructions could be given from the first signal-box to reduce the lights in the case of emergency, without the necessity of stopping the train.

If there is anything original in my ideas, I hope this letter will bring further information for the benefit of humanity.

E. B. WALLER.

Brimscombe, Feb. 7, 1916.

A Plea for Showroom Reform.

SIR,—I ask your kind indulgence in offering a few observations on the article by Mr. Cyril G. Davis in your last issue.

I may say at once that there is, in my opinion, very little contained therein to which exception could be taken. At any rate, he placed (taking human nature as we find it) a showroom attendant in a position of immense superiority, both intellectually and morally; so that "short of the inevitable pair of wings" he should indeed be a very desirable person to meet. It is, however, very difficult to get all these nice ideas developed, if other things are not equal.

I have read from time to time many admirable articles on salesmanship—all very impressive. In fact, during the process of reading, a kind of glow seems to rise in one's cheeks as to how important a man one is to the undertaking to which he belongs. This feeling of pride is, however, somewhat discounted when, upon reflection, one realizes that the quarter's rent and the rates are due. The wife, too, has mentioned the day before that some of the children require new boots. Perhaps, also, quite incidentally a glance is given at one's own trousers, and it is found that, although the crease is well developed, they are exceedingly "baggy" at the knees.

I say emphatically, one cannot get efficiency unless the salesman is paid a salary which will remove him from financial worries. I mean by that, a remuneration such as will enable him to put by a little for the time when he is too old to work, as well as to live decently. It is not sufficient for a man to dress expensively at the showroom, and allow his wife and family to feel the pinch at home.

There is also another aspect of this question to which Mr. Davis does not allude. It is that the showroom attendant should be allowed to feel that he is the firm, just as well as any other officer. The fact of his being so much in touch with the public is worthy of this alone.

I am quite sure, if all gas companies and firms connected with the gas industry would realize this important duty to their salesmen, they would get a much greater profitable return.

Feb. 11, 1916.

A SHOWROOM ATTENDANT.

Gas Matters at Ripon.

SIR,—My attention has been drawn to the paragraph under the above heading which appeared in your issue of Feb. 8.

The report is most misleading; and, in order to contradict any possible misinterpretation of the paragraph, I wish it to be made known that at the meeting of the Ripon City Council on Jan. 31, no reflection whatever was cast on the Consulting Engineer, Mr. J. W. Dunn, whose experience in regard to vertical retorts and gas-works practice is undoubted. It was thought wise to call in additional expert advice in order to strengthen and confirm the opinions expressed by Mr. Dunn.

J. BROWN,
Chairman of the Gas Committee.

Town Hall, Ripon, Feb. 12, 1916.

Coal Haulage at the Southport Gas-Works.

A month ago, the Southport Corporation Gas Committee considered the question of the provision of some means of haulage of coal-waggons from the gas-works at Blowick to Crowlands, consequent on the demands of the Government for horses, and the extra expense of maintenance of the latter. The Committee then decided to recommend that a locomotive should be purchased; but later Mr. Richardson (the Chairman of the Gas Committee) asked permission to take the recommendation back, as they had an alternative proposal to consider—the use of electricity. A number of experiments have been carried out, as a result of which Mr. Richardson, at the last meeting of the Council, in moving the new minutes of the Gas Committee, said they now recommended that the Electricity Committee should carry out a scheme, and charge the Gas Committee 1½d. per ton. This came pretty near the price it would cost to do the work by steam locomotive. The Gas Committee did not hold themselves responsible for the work being carried out, or the amount it was going to cost. In the course of a discussion as to why the Electricity Committee had reduced their original estimate of 1¾d. to 1½d. per ton, Mr. Hampson (the Chairman of the Committee) said he had gone again very carefully into the matter, and found the cost was 1½d., or, to be exact, 1·2d. per ton. The minutes were approved.

Concession to Large Consumers at Leigh (Lancs.).—The minutes of the Leigh (Lancs.) Town Council, which were confirmed at the last meeting, showed that, as from Jan. 1 last, the charge to consumers of 1 million cubic feet of gas for trade purposes will be 2s. 9d. per 1000 cubic feet, less a discount of 3d. for prompt payment.

Coal and Oil Matters Discussed at Oldham.—At the last meeting of the Oldham Gas Committee, Alderman Wilde, J.P., the Chairman, again alluded to the serious position they were in regarding coal supplies for the gas-works. In a report submitted by the General Manager (Mr. Arthur Andrew), it was reported that stocks were now so low that there was a danger that they might not last out. The Committee had repeatedly pressed the contractors for delivery, but without tangible result. The total shortage on the seventeen contracts for this year was 15,000 tons. Mr. Tim. Duxbury, the Gas Engineer, informed the Committee that local contractors were doing a little better in regard to deliveries, but they were still a long way behind contract times. Other collieries had written saying they were doing their best regarding deliveries, and had urged the Committee to put the serious position of affairs before the Government. Owing to the scarcity of coal, and the necessity of preserving as much stock as possible, it was essential that the Committee should purchase 30,000 gallons of gas oil, although the price was 100 per cent. more than before the war. The recommendations were agreed to.

REGISTER OF PATENTS.

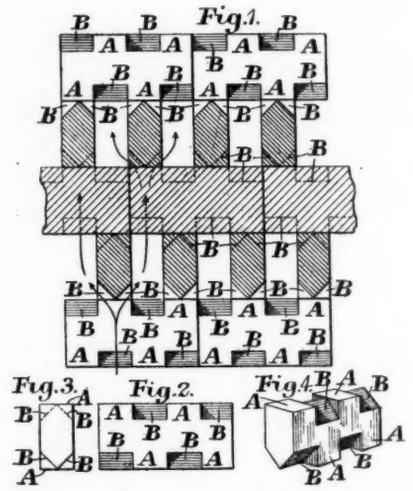
Chequer-Bricks for the Chambers of Carburetted Water-Gas Plants.

DAVISON, E. J., of Cricklewood, N.W., and TOOLEY, C. P., of Leeds.

No. 745; Jan. 18, 1915.

This invention relates to improvements in chequer-bricks of the type described in patent No. 436 of 1906, with the object of further preventing or minimizing the lodgment of dust or carbon in the chequers, of further reducing the friction of the gases passing through the chambers, and of providing for the breaking of the joints between successive courses of the chequer-bricks.

The chequer-brick is constructed with alternate square pedestals and double-bevelled recesses both on its upper and lower surfaces; but the pedestals and the recesses are each equal in length to the unit width of brick, and are thus equal and uniform, while the double-bevelled recesses are in all cases formed with a fine edge in lieu of the rounded or extended edges hitherto proposed. The pedestals and recesses are arranged in staggered formation—each pedestal at the top being opposite a recess at the bottom, and each recess at the top opposite a pedestal at the bottom. Thus when the chambers are built up, with the bottom pedestals of each brick bearing on the upper pedestals of the course of bricks at right angles below it, "a double-bevelled fire-edged recess occurs at the top and bottom of each brick at all points where the gases are in contact, and the lodgment of dust or carbon in the chequers is thereby prevented, and the passage of the gases at the same time facilitated."



Davison and Tooley's Chequer Bricks for Water-Gas Producers.

Fig. 1 is a sectional elevation of part of a chequering chamber built up as mentioned, A being the square pedestals and B the double-bevelled fire-edged recesses of each chequer-brick. Fig. 2 is a front elevation, fig. 3 an end elevation, and fig. 4 a perspective view, of a single chequer-brick of the form shown in fig. 1.

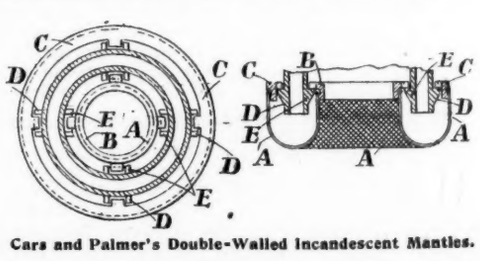
The pedestals A and recesses B may be so arranged in each chequer-brick as to provide for each successive course of bricks being set either flush with the joints of the preceding course in the usual manner, or to break joint with same. In the latter case the pedestals at the extreme ends of each chequer brick would be of a length equal to one-half only of the unit width of the brick. Also, the bevel of the recesses might be either flat or curved and at any angle or radius; but the recesses in all cases must be formed with fine edges.

Incandescent Illuminating Mantles.

CARS, B., of Highbury, and PALMER, W. D., of Muswell Hill, N.

No. 1004; Jan. 21, 1915.

This invention has for its object to provide means for removably attaching an annular double-walled mantle to a burner nozzle.



Cars and Palmer's Double-Walled Incandescent Mantles.

A plan and section are given of an annular double-walled incandescent mantle, having the invention applied to it.

The mantle (designed for use with a high-pressure burner) is formed with double walls A having a space between them, in which the flame burns. The mantle takes the form of an annulus, the double walls

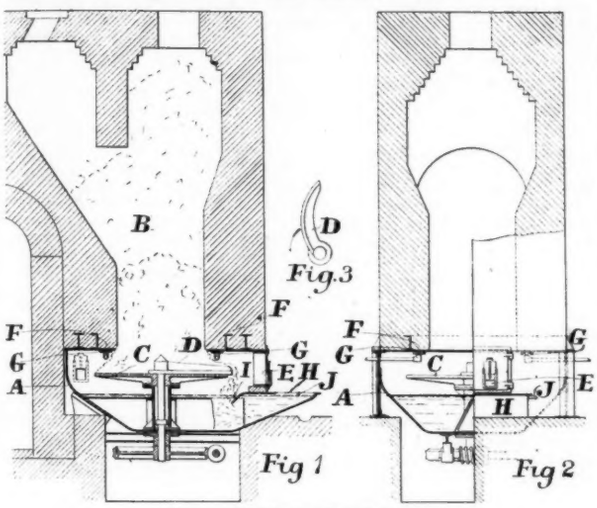
having a U or gutter-like section at any part of the circle, and is usually employed with a correspondingly shaped burner. The means for attaching the mantle to the burner nozzle consists of two rings B C, of refractory material, one carried by each wall. The inner ring B is furnished with external lugs or projections, while the outer ring has internal lugs. The burner nozzle is furnished with corresponding lugs or catches D E.

Gas-Producers.

GLOVER, S., of St. Helens, and WEST, J., of Southport.

No. 5315; April 8, 1915.

This invention has for its object to provide a simple arrangement of parts around, and in combination with, the ash-extracting means at the lower end of the producer furnace, so as to "ensure high furnace efficiency with uniformity of gas production by obviating the employment of clinkering or ash-extracting doors or valves."



Glover and West's Gas-Producers.

Fig. 1 is a sectional elevation of the producer. Fig. 2 is a view at right angles—the left-hand part being in section and the right-hand part mainly an elevation. Fig. 3 is a plan of the mechanical extractor.

There is a chamber or casing A around the lower end of the producer B. It surrounds the furnace grate C and ash-extractor D, and receives the ashes discharged. The primary air for the furnace is obtained through slide-controlled apertures E, in the chamber wall—"preferably disposed equidistant around the chamber, so as to ensure a more uniform distribution through the fuel in the furnace."

Around the underside of the lower part of the furnace and on the upper wall F of the chamber is provided a channel G, with apertures or slots in it through which water can be projected, in spray form, on to the ash on the grate, so that the steam generated, rising through the fuel, maintains a sufficiently reduced combustion temperature to prevent fluxing of the ash. The unevaporated water flows over the ash and keeps the metal in contact with it at a low temperature.

The mechanical extractor D comprises a vane-like element adapted to be slowly rotated over the surface of the grate C at a distance from the lower open end of the furnace B; the dimensions of the grate being such as to ensure that the ash can rest on it at its angle of repose, and so prevent the self-discharge of the furnace. The ash falls from the grate into a water-sealed container which forms the lower part of the chamber A; and access to the bath, for withdrawing the ash, is obtained by way of the mouth H projecting beyond the furnace—a lip-like part I dipping into the water adjacent to the mouth so as to prevent ingress of air to the furnace, notwithstanding small variations in the level of the liquid in the bath. The level of the water in the bath is maintained constant by an overflow pipe J.

Liquid Meters.

ALGER, H. C., of Chicago, U.S.A.

No. 2494; Feb. 16, 1915.

This invention relates to meters of the type in which the liquid being measured flows through a weir opening formed in a weir-plate so curved that the rate of flow through the weir opening is in direct proportion to the head. The object aimed at is to provide a meter in which the area of the plate containing the weir opening is reduced to a minimum, with a consequent reduction of resistance to the flow of the liquid, and in this and other ways to improve the construction of such meters whereby they will be "efficient and accurate in operation" and the necessity for abstruse or complicated calculations will be obviated.

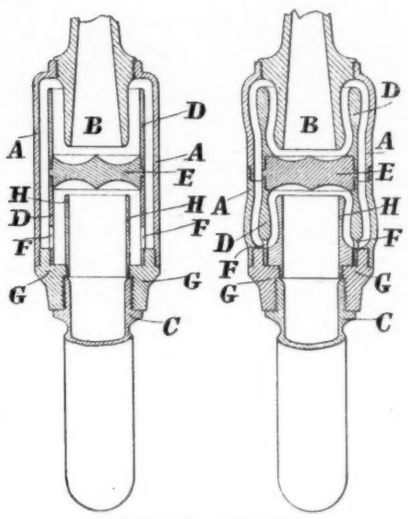
For this purpose, the opening is provided about its edges with laterally extended narrow strips, which cause the liquid to fall clear of the walls of the weir frame so as to avoid the trickling of the liquid down the wall faces as has heretofore sometimes been the case. Furthermore, the opening for the passage of the liquid is preferably enclosed by upwardly extending walls of gradually increasing height—the narrow curved strips being formed at the upper ends of the walls and extending part of the way across between them and forming a curved surface, between the parallel lateral edges of which is left a weir to measure the flow of liquid.

Incandescent Gas-Burners.

TILLEY, F. C., of Kingsland Road, N.E.

No. 5941; April 20, 1915.

This invention, relating to the construction of inverted and other incandescent gas-burners, has for its object to construct the burner so that the mixture of air and gas "is properly combined before reaching the point of ignition."



Tilley's Incandescent Burner.

Sectional elevations of two forms of the device are shown.

A cylindrical chamber A is formed, into one end of which enters the usual mixing-tube B, and to the other is connected the burner tip or nozzle C. Inside the chamber A is positioned concentrically a tube D, which is smaller in diameter than the chamber A, and in which is a dividing wall E across about its middle. The tube D is preferably secured to the one end or bottom of the chamber A, and reaches nearly to the top. It is provided with holes F near its base. The wall E is preferably made thicker in the middle and edges than between the middle and edges, so that an annular recess is formed on each side of the wall as shown. The usual mixing-tube B passes down some distance into the chamber A, and is surrounded by the top part of the tube D, so that the end of the mixing-tube is only a little distance from the dividing wall.

On the base G of the chamber A is positioned another tube H, of about the same diameter as the opening of the burner tip or nozzle C, and, projecting up into the tube D, reaches nearly to the wall E.

The passages through the appliance are relatively of the same area throughout (so that the mixture in its passage passes freely through); the size of the passages being determined by the required quantity of gas to be used, allowance being made for expansion by heat.

In use the mixture of air and gas, passing out of the tube B, strikes against the side of the wall E, and passes inside the tube D over the end and along the outside and between it and the wall of the chamber A, and through the holes F at the bottom (or it may be under the bottom), and then between the inside of the tube D and the outside of the tube H; being diverted by the other side of the wall E and passing along the inside of the tube H and out of the burner tip C. Owing to the many changes of direction of flow, the patentee remarks, the fluid has become thoroughly mixed.

Gas-Producers.

MORGAN, P. B., of Worcester, Mass., U.S.A.

No. 6999; May 10, 1915.

This invention relates to the class of gas-producers for the production of fuel gas—particularly for effecting the automatic discharge of ashes therefrom. The essential features of the invention are not described apart from a number of sheets of detailed lettered drawings.

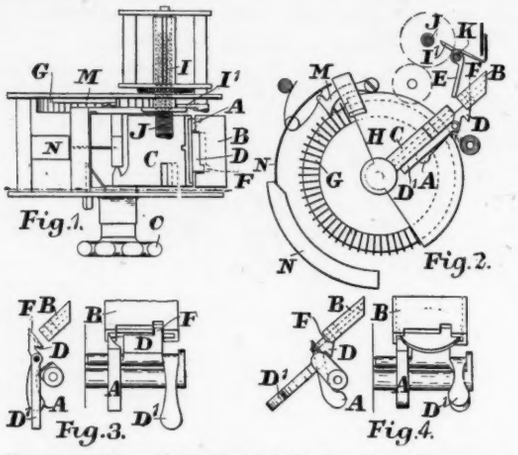
Coin-Freed Prepayment Mechanism.

MERCER, A., of Longsight, YOUNG, E., of Droylsden, and METERS LIMITED, of Manchester.

No. 6739; May 5, 1915.

This invention relates to means for controlling the passage of coins through the coin-shoot in gas-meters by providing (adjacent to the shoot) two independent pivoted arms or levers adapted, when in their normal position, to obstruct the egress of coins from the shoot, but to be moved clear of the latter by the movable coin-holder of the prepayment mechanism when the holder is brought into place to receive a coin from the shoot. One of the levers prevents the egress of a second coin from the shoot when two coins have been placed in it immediately after one another; and the other lever prevents egress of coins from the shoot when the prepayment mechanism has been operated to the full prepayment capacity.

Fig. 1 is a plan (partly in section) of the coin-freed prepayment mechanism referred to. Fig. 2 is a sectional elevation. Fig. 3 shows two views at right angles to one another of the means for preventing the passage of coins through the coin-shoot. Fig. 4 shows similar views, but with a coin in position ready for the reception by the movable coin-holder.



Mercer and Young's (Meters) Limited) Coin-Freed Prepayment Mechanism.

The lever A is mounted adjacent to the base of the coin-shoot B; the lower end of the lever being weighted to cause the other end to rest normally in a position in which it prevents the egress of coins from the shoot. The lever preferably has its acting end rounded or shaped at the part where it lies adjacent to a coin issuing from the coin-shoot, so that should two coins be inserted immediately after one another in the shoot and one be received by the movable coin-holder C of the prepayment mechanism, then, upon the holder being rotated clear of the base of the shoot, the shaped end will move in front of the coin in the shoot and prevent its egress therefrom (see fig. 4). The coin-holder C, when positioned to receive a coin from the shoot, engages the lever A above its pivot point, and holds it in a position clear of the shoot, so that a coin in the shoot can travel into the coin-holder.

A second weighted lever D is provided for obstructing the egress of coins from the shoot when the prepayment mechanism has been operated to its full prepayment capacity. The end D^1 of the lever D serves as a weight to hold it normally in position to obstruct the passage of a coin from the shoot to the cash receptacle. The coin-holder, however, engages the lever above its pivot point, and moves it clear of the shoot when the holder is in position to receive a coin from the shoot. When a sufficient number of coins have been placed in the coin receptacle at one time, the arm E of the prepayment mechanism is traversed by the member I (actuated by gearing from the wheel G) through the arms I^1, so that it engages the projecting piece F on the lever D and prevents the movement of the lever to allow of the passage of coins into the coin-holder. The consumption of gas causes the withdrawal of the arm E from contact with the lever D by the rotation of the screw J by the gas measuring mechanism.

No claim is made in the present application to any particular form of prepayment mechanism. That shown comprises a wheel G having teeth upon its face for engagement by the coin in the coin-holder C. An adjustable guard H controls the period in the rotary movement of the holder C at which the coin in the holder enters the teeth of the wheel G. The rotation of the latter through the medium of the coin in the coin-holder causes the rotation of the member I on the screw J. The arm E is put in operative connection with the member I by arms I^1, so that it is traversed with it upon its supporting rod K, but is not rotated by it. The gas-measuring mechanism of the meter rotates the screw J. A pawl M prevents backward rotation of the wheel G, and a guard N prevents the coin from falling out of the coin-holder until the operative traverse of the latter is completed.

LEGAL INTELLIGENCE.

WORKMAN'S COMPENSATION CLAIM.

Action Against the Wandsworth Gas Company.

At the Wandsworth County Court on the 7th inst., before Judge HARINGTON, the Wandsworth, Wimbledon, and Epsom District Gas Company were defendants in an application for an award under the Workmen's Compensation Act, brought by Henry Ferrier, a service-layer's labourer.

Mr. SIDNEY LAMB was Counsel for the applicant, and Mr. ELLIS HILL (instructed by Messrs. Sloper, Potter, and Goschen) appeared for the defendant Company.

Applicant, giving evidence, stated that he had been in the employment of the defendants for a number of years. On Jan. 11, 1915, he was getting out some pipes from the pipe-rack in the yard of the Mitcham Gas-Works, when one of them fell on his thumb, bursting it open. He reported the accident to the Assistant Superintendent, but continued his work for two days. He afterwards went to Dr. Love, who gave him a certificate, which applicant took to the works; and he was told that he must stop work at once. He was attended by Dr. Love, who, on Jan. 23, advised him to go to the hospital. He had attended St. Thomas's Hospital, where his thumb was operated upon. Applicant could not use his hand because he could not grasp anything with the thumb.

In cross-examination, witness said he had suffered from blood poisoning in his thumb. His thumb had not healed up by June. Dr. Love had told him that he had better do some light work; but the Superintendent said there was not a light job to suit him.

Counsel referred to the fact that the Company, in December, wrote offering applicant light work in assembling parts of gas-cookers, &c.

Applicant said he was not able to do this work.

In further examination, applicant said he had undergone massage treatment.

Dr. *Richard Theodore Timberg*, Medical Officer in charge of physical exercises and massage at St. Thomas's Hospital, said he first saw applicant in May, 1915, when he prescribed treatment; but applicant did not improve under it, and was discharged. In December he came back, and was then put under massage treatment. In his opinion, the loss of flesh on the inner side of the thumb had brought the nerve end up to the surface; and this was what produced the pain.

Sir *John Colley*, called by the Gas Company, said he saw applicant with Dr. Love, in December. He found on examination that the terminal joint of the thumb was stiff from want of use, and partly from the remains of a former inflammation. The condition was almost wholly the result of want of use. He had examined him carefully for tenderness over the scar and generally over the whole thumb, and he made no complaint. There was no evidence of the nerve being involved in the scar tissue, for the only possible evidence of such a condition would be extreme tenderness and complete incapacity to submit to the examination which he made. Applicant would not have been able to stand massage, which, obviously, was the worst possible treatment for a scar which involved a nerve. The proper treatment would be to cut down to the nerve and remove it. If the applicant were really anxious to do work, he could do anything; but he (witness) thought for some time he ought to be excused wielding a heavy hammer, which, applicant had stated, was part of his work. He would certainly be able to do such work as assembling parts of stoves.

COUNSEL: The man says he is suffering pain. What is your view of the right treatment for this thumb?

Witness: Work—and work only, and being compelled to do it.

Dr. *Henry Love* having given evidence,

Mr. *Arthur F. Ball*, the Chief Inspector at the Mitcham Works, stated that he remembered applicant coming to the works in April with a certificate from Dr. Love. The matter was talked over, and it was suggested that applicant should come and see him in a week's time; but he had not seen him since. In December, the work of assembling stoves was offered to applicant at his old wages. Witness described what the work consisted of.

In cross-examination, witness said he did not tell applicant, when the latter came to see him, that he would communicate with Dr. Love and let him know. He had no recollection of seeing applicant since April 27. From that date until Dec. 10 last the Company had been paying him half wages.

The Medical Assessor having examined applicant,

His HONOUR said the question was purely a medical one. On the evidence of Dr. Love (applicant's own doctor), and that of Sir John Colley, it was shown that the man was perfectly fit for light work so far back as June last, and even earlier—in April. Work which he could have done was offered to him in December. He declined to attempt to do it; and now he had come to the Court—his compensation being stopped—to ask for an award. The Medical Assessor was entirely of opinion that, if applicant had taken the advice which was offered to him, and done the work he was capable of doing in December, he would now be in a condition to do his full work. He made an award in favour of the respondents, with costs.

Wilts County Gas Company.—Action on Guarantee.

The action of *Wilts County Gas Company v. D'Arth and Another*, which was brought to recover the amount due under a guarantee, was in the list for hearing last Wednesday before Mr Justice Ridley in the King's Bench Division of the High Court of Justice. Mr. Lincoln Reed, who appeared for plaintiffs, said he was glad to say the Court would not be troubled with the case, as the parties had come to terms. By consent, there would be judgment for plaintiffs for the amount claimed on the writ, and certain terms had been arranged as to execution which would be handed in to the Associate. Mr. S. Lynch, for the defendants, said he agreed to the order in the terms arranged. His Lordship entered judgment accordingly.

Claim against the Dublin Gas Company.—Mr. Justice Pim, in the High Court of Ireland, has affirmed a decision of the Recorder of Dublin dismissing a claim by Mr. R. E. Burnes, clerk, against the Alliance and Dublin Consumers' Gas Company for £12 10s. for work done, and £1 6s. the amount of fines which he alleges were improperly deducted from his salary.

Birmingham to Pool Coal Contracts.—Hitherto the Birmingham Gas and Electricity Committees have purchased their coal separately; but a Sub-Committee have now been appointed from the members of both Committees who will be empowered to enter into contracts for all the coal needed by the two undertakings. It is hoped that a great saving will accrue from the reduction in the number of contracts and the larger quantities which will be ordered under the contracts entered into. The scheme will be put into operation shortly. If the successful results which are anticipated are realized, it is expected that the system of "pooling" contracts will be extended to other requirements. The Lord Mayor is Chairman of the Sub-Committee appointed to carry out the negotiations; and in the instructions it is laid down that they may purchase coal, on request, for any other Committees of the Council.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of Proprietors was held on Wednesday last at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES CARPENTER, D.Sc., in the chair.

The SECRETARY (Mr. F. M'Leod) read the advertisement convening the meeting, and the minutes of the last ordinary general meeting. The seal of the Company was affixed to the Register of Proprietors.

THE CHAIRMAN'S SPEECH.

The CHAIRMAN: Ladies and Gentlemen,—I have now to move: "That the report and accounts now presented be received and adopted, and the report entered on the minutes." In the first paragraph of the report you have the key to the working of the Company during the past half year; and I do not think a perusal of it will lead to any other conclusion than that the Board decided rightly when they determined to raise the price of gas to 2s. 10d. per 1000 cubic feet—the amount carried forward being barely the equivalent of ¼d. per 1000 cubic feet. By raising the price to 2s. 10d. per 1000, we have made both ends meet, with an amount to spare equal to ¼d. per 1000 cubic feet. The exact figure would have been 2s. 9½d.; but we had to raise it to a round figure, and so there is a small balance to the good.

THE SLIDING-SCALE AND THE DIVIDEND.

The dividend is automatically reduced in consequence to £4 8s. per cent.—a considerable drop compared with that customary before the outbreak of war. As a matter of fact, the constitution of the Company, if I may so describe the Acts of Parliament under which we work, was never framed to meet war times; and there is no doubt, in my mind, that the dividend payable does not represent an adequate return for the risks and difficulties inseparable from carrying on a business of this particular complexity and magnitude, and which increase rather than diminish—in other words, that the sliding-scale is not giving even justice at the present juncture. There is, however, no use in quarrelling with it, as certainly no remedy is possible during the continuance of the present struggle, and we must be content to make the best of it. I need not remind you that the general principle of the Sliding-Scale Acts, under which we work (and to these must be added the co-partnership), is that the burden of bad times should not fall wholly upon the consumers of gas, but should be borne, in addition thereto, by the shareholders and workmen. When, therefore, you consider how much the dividend has fallen, I would ask you to remember that the consumers are also suffering by reason of the increased price charged for gas, and the employees by reason of the diminished bonus earned under the co-partnership scheme. The burden has, at any rate, been shared. Could it have been mitigated?

COAL DIFFICULTIES.—THE FREIGHT QUESTION.

In discussing this, it will be necessary to first turn our attention to coal charges. We were for many years accustomed to buy coal delivered into our works at practically the same price as that which we have been asked to pay for its freightage alone to London during the past half year; or, to put the matter in another way, we used to buy our coal delivered alongside our wharves at a price somewhere about that which we paid for coal last year put into steamers in the North. I think these two facts will allow you to form a very good picture of the difficulties we have had to encounter in providing our supplies of raw material. I do not think, however, I can usefully add to the remarks upon the subject I made in this room six months ago, except to say that the position generally does not show signs of improvement. Some one must be making huge profits; but it is certainly not the gas companies. As you are aware, Parliament has now placed a limitation on the price to be charged for coal. That it is liberal may be judged from the fact that it is practically double that ruling ten years ago. An even more serious matter has been that of shortage arising mainly from the large number of miners who have enlisted. But as long as the Coal Export Committee keep their hands upon the export, the industries of this country should not run short. The handling of the freight question has been very disturbing; for the Government continues to ask for the use of interned vessels between three and four times what was paid in pre-war times. One is tempted to ask why it did not endeavour to control carrying freight by sea as well as by land, since our shipping is no less necessary to our existence than our railways. There is a Joint Board of Control for the latter; and I cannot see why the same principle could not be applied to our mercantile marine.

IMPROVEMENTS IN RESIDUALS.

Now the report goes on to tell you that some improvement has taken place in residual products. This is true of the three mainstays of our business—coke, tar, and ammonia—but, unfortunately, we cannot take full advantage of the higher values. In ordinary times we have a good market for our coke in the Northern parts of the Continent. Being made from Durham coking coals it has a ready sale at a good price. But having regard to the importance of keeping the Metropolis fully supplied with fuel, its export therefrom has been almost wholly restricted, in order that it should be available for home use. We cannot complain of this. Looked at broadly, it is, I think, a proper course for the authorities to adopt; but we are prevented thereby from disposing of our coke to the best advantage, having regard to the high price the raw material from which it is produced costs us. Of our tar products, the most important is pitch. There again, we produce a high-class make for which we have gradually built-up a good demand from the Continent. We could sell all our make there at good prices, for it is badly wanted by our Allies; but, unfortunately, the enormous rise in freights has checked our business very considerably, and has necessitated the stocking of quantities which, with reasonable freights, would find a ready sale. Our third great residual is ammonia, the demand for which is very heavy, and the export value of which is very high. The Government have, however, intervened; and, by the power they possess of restricting its shipment, they have fixed a moderate figure at which sales for home agricultural purposes must be made. Again, I do not complain of this. I think they are performing their duty to the country by their action; but I would point out to you that it all goes to prevent our making both ends meet without considerably increasing the price of gas to our customers. In other words, while we have paid heavily for coal, we have only been able to partially reimburse ourselves from residuals.

DECREASED GAS CONSUMPTION.

As regards the consumption of gas, I do not think, despite the decrease we record, this can be considered unsatisfactory. It must be remembered that, in addition to the ordinary public lighting, the high-pressure installations, which have figured prominently in recent reports, have been completely shut-down. In addition to this, there has been a substantial reduction in the consumption for shop-lighting, which is not to be wondered at when the change of shopping habits is taken into consideration. The domestic consumption appears to be unaltered, although from the gas-fire point of view the season has been a very unfavourable one. There has been a substantial increase in the use of gas for industrial purposes; and it is interesting to find that, although to produce a given amount of heat a pennyworth of coal has greater potentiality than a pennyworth of gas, yet the experience of large-scale installations goes to confirm what has already been demonstrated in the case of the cooking-stove—namely, that, owing to the ease of controlling the temperature and the fact that the losses of lighting-up and cooling-down are reduced to a minimum, gas can be profitably substituted for solid fuel in many cases where, on paper, want of economy would be predicted. Perhaps here I might say a word with regard to our production of gas. We have maintained throughout the half year the high quality and purity to which our consumers have become accustomed, though I regret our production per ton has not equalled in quantity that reached in pre-war times. The authorities are now asking gas undertakings to extract liquid hydrocarbons from their gas. Where water-gas plant exists, this is comparatively an easy matter, as the deficiency can be rectified by enrichment. We have, however, no water-gas plant, and must therefore consider some alternative method—a task which is not an easy one, but which we shall doubtless solve. I propose to deal with the next paragraph of the report when we get to the Wharncliffe meeting, at the conclusion of the present one.

LABOUR SCARCITY.—WAR BONUS.

I must now say a word with regard to the shortage of labour. But before I do so I ought to call your attention to a large item which appears for the second time in our accounts. It is described as "War Bonus and War Fund, £31,505." The bulk of this amount falls under the first item of war bonus. We have followed in this respect the example that the Government adopted in the case of the railways. Having regard to the increase in our charges for gas, we did not feel justified in granting increases of wages to meet the enhanced cost of living; but we felt that we were justified in paying a bonus in respect of the increased cost of living, which is at the same rate as that given to the railwaymen, whose circumstances of employment have some features in common. Dealing, now, with the supply of labour, there has not been a shortage in the ordinary sense of the word, for we have at all times been able to fully man our various works. But we have suffered by reason of shortage of skilled and unskilled labour trained to, and familiar with, the special conditions of our particular requirements.

CO-PARTNERS WITH THE COLOURS.

This will be readily appreciated when I remind you that we have lost the services of over 2200 of our employees, among whom were many exceedingly capable men. We have replaced them by others who are mostly above military age or unfit from the military standpoint. They have undoubtedly done their best, as have those who continue in our service, carrying (and willingly) a greater burden than is required or demanded in ordinary times. We have, in other words, sacrificed something of efficiency to the exigencies of the military situation. We have interposed no obstacle in the way of the man who desired to serve his country; and I am pleased and proud to tell you that we have sent two men to the Colours for every one furnished under corresponding circumstances elsewhere. That is, I think, a very remarkable fact; and I do not think it would have come about had it not been for the teaching of the duties of citizenship which, under the co-partnership system, our men have been brought up and trained in.

THE NEW CHIEF ENGINEER.

There is one other matter which, in conclusion, I must mention, and that is with regard to the Chief Engineer. The Board have filled the important post of Chief Engineer by the appointment of Mr. G. M. Gill. I have some knowledge of the arduous demands made upon the occupant of such a position. It is not enough that he should have a sound knowledge of his profession, but that he should have the health and energy necessary to enable him to practice it. Mr. Gill came to us with the highest credentials; and from what I have seen of him in his new position, I have every confidence that he will justify our choice. That concludes what I have to say with regard to the report. I will defer my remarks about the Bill until the Wharncliffe meeting. I beg now formally to move the resolution.

The DEPUTY-CHAIRMAN (Mr. Kenneth P. Hawksley): As the Chairman has so fully covered all the items in the report and balance-sheet, I do not think there is anything I can usefully add to what he has said. I have much pleasure in seconding the resolution.

The CHAIRMAN: If any lady or gentleman desires to make any remark on the report, we shall be very pleased to listen.

REMARKS BY SHAREHOLDERS—AN APPRECIATION.

A SHAREHOLDER asked for some further information of an item in the capital account showing the actual amount of money raised and expended—"Received since June 30, £180,000, less £32,400." He understood the Company were raising £100,000 on that particular occasion at £82 per £100 for the purpose of purchasing boats; and he should be glad to know if any had been purchased. "Temporary loans" in the last balance-sheet stood at £360,000, and now it was

£470,000. How was it the amount had increased when they had the £180,000? He also desired to know whether the amount paid for freight had decreased.

The CHAIRMAN: We have on order at the present time some new vessels, and towards their construction we have paid a substantial amount. You cannot buy a ship already built at the present time; you have to place an order for it, and wait until it is built. Owing to the demands of the Government throughout the country, shipbuilding is not going on as expeditiously as in normal times, in addition to which the engineering departments are very full. You have to pay so much down when you make the contract, in order that the person who builds the ship may buy the raw material, and, as he goes on building, you have to pay instalments of the purchase price. By the time we meet again I hope to be in a position to tell you that we have one, at any rate, of our new ships running. I have not yet dealt with the loan question, as I wish to explain that as a whole when discussing the increase of capital at the extraordinary meeting.

Professor H. ARMSTRONG said he should like to take the opportunity of congratulating the Board on the great scientific advance made in recent times which distinguished them from every other gas company in the kingdom. Several years ago their late Chairman, Sir George Livesey, got the sulphur clauses removed, and he (the speaker) was one of those who deprecated that policy, as he thought that in the long run it would be detrimental to the gas interests. The quality of gas was consequently so affected that electric lighting gained a considerable advantage. This practically was the effect of the relief then gained—that gas went down in its purity, and many consumers had reason in their houses to realize the bad effects of sulphur compounds. He did not pretend to be a thought-reader, but he knew the Board set to work ten years ago to remedy the evil. It had taken a long time to accomplish the end; but it had been done towards the close of 1914, when the Board introduced a method of sulphur purification which stood alone on account of its excellence, and which system must at no distant date be adopted throughout the country. By this method the Company had recovered very largely the position of gas; and he desired to thank the Directors for the great advance thus made.

The CHAIRMAN: I thank you for your appreciation of the Board's efforts in the direction of purer gas. The task has been a thankless one; but when we have so high an authority as the last speaker commending our efforts, I am sure what we initiated a long time ago was a step in the right direction, and I feel confident it cannot but redound to the strength of the position of gas for all purposes.

The resolution was then put and carried unanimously.

THE DIVIDEND.

The CHAIRMAN: I have now to move:

> "That a dividend at the rate of £4 8s. per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post."

Mr. JOHN MEWS: I have much pleasure in seconding the resolution. It has been suggested to me that six months ago I made some statement as to why the stock in this Company was lower than it had been at any time previously in its history. At that time the price was 83; the return on it being just over 5 per cent. To-day the price in the market is lower by 5 points—it is now 78; and the return upon that is about £5 12s. Perhaps you may ask me why did I tell you what I thought about things last year when now they do not appear to be as good as they were then; and I will therefore endeavour to explain. At that time 83 was the comparative price of the new war loan, which was issued at 4½ per cent. To-day the price of 78 is caused because the Government are issuing Exchequer Bonds which are paying 5 per cent. Of course, you cannot possibly expect that a Company like this can compete with a 5 per cent. Government stock; but you may wish to know that I do really think there is a glimmer of hope that the point we have reached in the price of the stock is more inclined to go up than it is to go down. I will give you my reason. Immediately the war started, the Government and the Stock Exchange arranged that certain gilt-edged securities should not be dealt in except at the price which obtained before the war. This in many cases has continued, and is continuing now. You know that people were not allowed to sell, or buy, Consols under 65. This minimum has been taken away, and the stock dropped at once to 58¼. My own view is that, as soon as the other minima are taken off railway and preference stocks, our stock is bound to appreciate to some extent. You know the death duties are very heavy. Executors have had tremendous difficulty to raise money on estates; they could not raise it by selling railway debentures or preference stock, because nobody would buy them at the minimum price. When the minima come off, a large number of people have to come in and sell who have only been able to pay the Government by borrowing at a higher rate of interest than what they are receiving on the stock; and they will be able to pay the Government out of the sale of debenture stock. What I wish to point out is that we and others have had no minimum placed upon our stock. We sold it simply for what we could get. If people have to pay large death duties, they try to raise the money. In many cases where they would prefer to sell railway shares or debenture stock, if they could have done so, they sold our stock; and this depreciated the market. As soon as you take off minimum prices from gilt-edged securities, the price of our stock will go up, as there will not be the same necessity to sell.

The resolution was put and carried unanimously.

RE-ELECTION OF DIRECTORS AND AUDITOR.

The CHAIRMAN: I have now to move "That Mr. Frank Bush be re-elected a Director of this Company." I need not enlarge on the valuable services Mr. Bush has been able to render to the Company for so many years; but I can assure you that he is in every way a valuable and (if I may say so) necessary colleague.

Mr. K. P. HAWKSLEY: I have much pleasure in seconding the motion.

The resolution was passed unanimously.

The CHAIRMAN: I now beg to move: "That Mr. Frank Harding Jones be re-elected a Director of this Company." I need not say anything with regard to him, except that his special qualification, apart from being an able business man, is of great value to us—I mean with regard to gas supply.

Mr. HAWKSLEY: I beg to second the resolution.

The motion passed unanimously.

Mr. FRANK BUSH: I thank you for this renewal of your confidence. We are passing through very anxious times, and I desire to act with my colleagues in assisting the Chairman to deal with the many and complex questions which must necessarily arise.

Mr. F. H. JONES: I thank you for re-electing me a Director of the Company. It is a great honour, as well as a pleasure to be on the Board and to work with my colleagues.

Mr. T. S. SODEN, having been unanimously re-elected an Auditor of the Company, briefly returned thanks for his re-election.

Extraordinary Meeting.

The SECRETARY having read the advertisement convening the meeting,

THE COMPANY'S BILL EXPLAINED.

The CHAIRMAN said: I now rise to explain the reasons which have decided the Board to promote this Bill, and I will later move a formal resolution for its adoption, and then ask Mr. Browne, our Parliamentary Agent, to explain the drafting of the Bill in order to show how the intention is to carry out its objects. Those of you who are in the habit of following the reports of these shareholders' meetings will have noticed that it has been customary with me to deal generally with our business during the period under review, and not to weary you with many of the ups-and-downs of various items in the accounts which are more often matters of detail than of principle. I must, however, make an exception to the rule in dealing with the proposals of the Board for increasing the capital of the Company, and the circumstances which have required them to ask your approval of a Bill in Parliament in order to carry out their proposals. The first question most of you would ask is, I think: "Why, if the business is practically stationary, is it necessary to issue new capital?" Well, our capital requirements may be divided into two parts. In the first place we have to provide money to purchase land on which to erect the apparatus necessary for the manufacture of gas and residual products, to lay down pipes in the streets, and to provide meters to enable the consumption of each consumer to be ascertained. Now, it is not for this purpose we require capital to-day. In addition, however, to what may be called our fixed capital, we have to provide floating capital before we can commence trading. Our most important requirement is, of course, coal. We are buying it all through the year, paying for it weekly as it is delivered to us. But a considerable time elapses before the money we have paid for coal comes back into our hands as payment for gas and residual products. To keep our business going we therefore require a certain amount of floating or liquid capital. The amount we require depends primarily upon the cost of coal. Suppose, for instance, we have to provide a working stock of 250,000 tons of coal paid for and laid down on our works. We should require for this use a floating capital of £125,000, if the value of the coal so stocked were 10s. per ton. If, however, coal rose in price to 25s. per ton, we should have to set aside £312,500 for the purpose. Similarly with our products. When coal is high, these generally follow suit. Take coke, for instance. Its fuel value is much the same as coal. If we have a stock of 50,000 tons, its value may be either £25,000 when coal is cheap, or £62,500 when coal is dear. And so on with other products. In addition to providing stocks of raw and finished material, we also have to give credit in respect of what we sell. Take gas, for instance. Suppose we provide 1000 tons of coal and convert it into gas. It may be three months before the account for it goes in, and another month before it is paid, although the coal was paid for within a week of its receipt. There is another important factor which comes in, and that is the larger and more costly stocks of meters, stoves, and fittings we have to keep, in order to satisfy the more exacting requirements of our consumers. At one time it was the practice mainly to order these from the manufacturers when the consumers wanted them. We have now to keep them in stock ourselves; for the consumers will not wait, but expect to have their orders satisfied quickly after they are placed by them with us. I think you will see from this that, while our business goes on without difficulty when prices are normal, we are faced with the need of greater capital when prices are high—in other words, we need more floating capital to meet our obligations. Our practice in the past has been to provide this by a loan from our bankers. Economically this practice was sound, as, instead of providing our own capital on which there would be interest charges to meet every year, we only borrowed when we wanted it, and paid interest for the shorter period. It is probable that we might have made no change in this procedure but for the war and the hardening of the financial position. Our bankers met us very fairly in the matter, and agreed to finance our requirements until such time as we were able to get parliamentary sanction to the issue of new capital; and this is the object of the present Bill. Whatever stock it may be considered desirable to issue, we ask powers to redeem it, because we do not want the continued burden of capital bearing a high rate of interest for an indefinite period. We want to redeem it when favourable opportunities arise. We follow in this respect the example of a Special Act of Parliament which was passed for this very purpose in the last session of Parliament. So far as our consumers are concerned, they will be no worse off by reason of the money we require being obtained by a legalized issue of stock instead of by a loan from our bankers. Nor will present shareholders be seriously affected; for we shall probably pay as interest on the stock little, if anything, more than we pay now on bankers' loans. But we shall be in a legalized position, instead of one of uncertainty which may be open to question. The proposals of the Board must not be taken as any departure from our practice for many years in keeping our capital account as low as possible; for this is conducive to good working and strengthening the Company's position, For this reason we shall redeem what issues we may make as rapidly as possible. I may put the matter in another way by referring to some figures in the balance-sheet for the three years 1905, 1910, and 1915. The cost of our coal stock at the end of December was as follows: 1905, £60,170; 1910,

£149,560; 1915, £250,000. Coke—1905, £4600; 1910, £7200; 1915, £60,800. Tar and tar products, £55,000 in 1905, £40,000 in 1910, and £73,000 in 1915. Meters and stoves in 1905 £76,500, in 1910 £111,000, and in 1915 £148,000. Or, if I add the three figures together, the value was £197,000 in 1905, £3~8,000 in 1910, and £532,000 in 1915. Our outstanding accounts also come into question on these particular dates. In 1905 £313,000, in 1910 £295,000, and in 1915 £334,000. Coke products: 1905, £40,000; 1910, £46,000; and 1915, £150,000. Sundries, £9000, £24,000, and £20,000. The total of these items is: For 1905 £362,000, for 1910 £367,000, and for 1915 £509,000, or a total for the two together of £559,000, £675,000, and £1,041,000. This question does not affect our stability as a going concern at all; it simply means we want more capital owing to the greater cost of raw material. I do not know whether I have made the matter clear to you. If not, I shall be pleased to answer any question that may be put to me.

A SHAREHOLDER asked what was the increase of capital in the three years referred to in proportion to the increase of the stock.

The CHAIRMAN: In 1905 the capital was £419 per million cubic feet of gas made; in 1910, it was £423; and in 1915, £414. The capital has practically kept up with the increase of business in the past ten years; but, speaking generally, we have been able gradually to reduce our capital charges per million cubic feet of gas made in spite of the fact that our business is getting more complicated by reason of increased obligations to the shareholders. Does that answer your question?

The SHAREHOLDER: Not quite; what I wanted to know was in relation to the stocks in hand.

The CHAIRMAN: I have given you the stocks for the three years, and I can give you the amount of money raised.

Another SHAREHOLDER asked whether, considering the importance of gas residuals, it was the intention of the Board to allocate any portion of the money to research treatment.

The CHAIRMAN: I will answer that question when I have replied to the other shareholder. In 1905 our capital figured at £5,096,000, in 1910 £5,328,000, and in 1915 £5,476,000.

A SHAREHOLDER said there was no doubt the Company would require fresh capital. The Directors had decided that, and he was perfectly sure the large number of shareholders present that day would endorse the policy. But the question was: How are you going to get the money, and what amount do you want? The last loan was not offered to the shareholders, as was explained at the time; but he had no doubt on this occasion it would be obtained on good terms. He wished to know whether the amount called up would go to lessening the bank debts or in paying for coal.

The CHAIRMAN: With regard to the question as to research treatment of residuals, I may say we can do this out of revenue. As to the allocation of the new capital, it is wanted to pay off our bank loan. I now beg formally to move:

> "That the Bill now submitted to this meeting, intituled 'A Bill to authorize the South Metropolitan Gas Company to raise additional capital, and for other purposes,' be and the same is hereby approved, subject to any amendments which may be made therein by Parliament and approved by the Directors."

Mr. K. P. HAWKSLEY seconded the motion.

Mr. SODEN said as the Bill would enable the Company to raise additional capital, could not a definite amount be inserted?

The CHAIRMAN said this was dealt with in the Bill.

Mr. BROWN (the Parliamentary Agent) said: The Bill before you to-day is a very short one, as it is confined to the financial position; the first object being to increase the capital and the borrowing powers—to improve the conditions under which the Company are obliged, owing to the provisions of the Act, to issue new capital, and, next, to exercise the new capital power by the issue of redeemable stock. These three objects form mainly the body of the Bill. The first clause is the common form clause, giving the Act a formal title. Clause 2 applies to the financial provisions of the Bill—to certain clauses contained in the Companies Clauses (Consolidation) Act, 1845—that being a convenient form of applying to the Company provisions relating to their obligation which are applied to all statutory companies. The third clause is the declaration of the present capital and borrowing powers of the Company. The reason for this clause, which is not customarily a clause appearing in a company's capital Bill, is plain—it is considered desirable to wipe-out the existing provisions of the Act relating to capital and start with a clean sheet. The fifth clause is an additional capital clause—that the Company may raise from time to time additional capital not exceeding in the whole £1,000,000. This clause enables you to raise £1,000,000. You have power to raise by the issue of ordinary stock £81,358. This sum will be wiped off, and you will begin with your new capital power of £1,000,000; so that the actual net new power conferred by the Bill will be £918,642. Clause 6 enables the Company to borrow on mortgage any sum not exceeding one-third of the amount of money raised by the issue of ordinary capital. This is a common form clause; but it has not appeared in your financial Act for some little time. Before the Act of 1882 you had power to borrow money on mortgage of the undertaking; but in that Act you abandoned this power, and confined your power to raising money on debenture stock. In these times of financial stress it is thought desirable that every available means of raising money shall be open to the Board; and for this reason it is suggested the Company should resume the power they formerly possessed. This sum will be limited to one-third of the money raised on ordinary stock. The limit will be £333,333. There, again, this will not be in addition to the powers you have to-day, as you have an unexercised balance of borrowing power of £162,728. The net new powers of borrowing are £170,605. Clause 7 is a common form clause authorizing the issue of debenture stock in substitution for the powers of borrowing on mortgage. This does not give any greater or other power of charging the Company's undertaking. Clause 8 deals with provisions contained in the financial Acts of the Company, which are not wiped out of existence by clearing off the slate your unexecuted borrowing powers. The provisions of the Act relating to debenture stock are a little intricate, and on strict construction difficult to reconcile one with the other. That is one of the reasons it is thought desirable you should get rid of the intricate provisions contained in Acts built up during the last 73 years, and start with more beneficial financial provisions. So clause 8 proposes to dispose of the clause of the existing Act. Clause 9 deals with a matter which is familiar to most of you—what we call auction clauses regulating the mode in which you have to issue ordinary or preference stock. At the present time the course of procedure is this: There is power to the Company to offer the stock in the first instance to consumers and employees at the average market price for the month preceding the offer. It is obvious if the price of the stock is falling during the month preceding the offer the average price will be higher than the price at the end of the month, you may be offering it at a price which exceeds the price at which it could be bought on the market. Clause 9 proposes to improve this state of things by saying that the average prices shall be taken over the preceding fourteen days instead of a month. The next step is that all the stock has to be offered for sale by auction or tender at a reserve price which is not less than the nominal amount of the stock. It is impossible to get rid of stock at par at the present time. Therefore the clause provides that the reserve price may be such price as should be reasonably determined upon by the Company. This is in accord with the more modern provisions of the gas companies' auction clauses. There are other smaller points bringing the auction clause more up to date. Clause 10 deals with the important power of issuing preference or debenture stock in the form of redeemable stock, to which the Chairman has already referred. It follows in principle the precedent of numerous parliamentary companies. There are some eight railway companies who have obtained power of this kind, and at least one water company. The Company have no power to issue preference stock, and one of the provisions of the Bill is that preference stock may be issued for raising new capital. Clause 11 is a formal one which has to be inserted for raising capital—that the capital raised shall only be applied to capital purposes of the Company. Clause 12 provides for the payment of the costs of the Bill by the Company. It may be within the knowledge of some of you that in the course of proceeding with Bills presented since the commencement of the war, the Treasury have insisted on the insertion of a clause that money cannot be raised without the sanction of the Treasury. We have agreed to insert the usual form of clause. It is relevant to observe that the Treasury have already sanctioned the raising by the Company of a substantial sum in excess of the amount recently raised; so there is still a margin available, and we have little doubt the Treasury will recognize that margin as existing. There is one other slight point. The Borough Council of Lambeth asked for a minor amendment of clause 5—that the new stock should be subject to the sliding-scale provisions.

The resolution was put and carried.

The CHAIRMAN: That concludes the business of the meeting.

VOTES OF THANKS.

A SHAREHOLDER said they ought not to leave without recording their appreciation of the services rendered by the Directors. He knew something about gas manufacture and the difficulties connected therewith, and felt sure that were he offered £5000 a year he would not take over the responsibility.

The motion was seconded and carried unanimously.

THE OFFICERS AND STAFF.

The CHAIRMAN: On the part of the Board I thank you very sincerely for this recognition of our services. The position we hold is by no means a sinecure; but we have done our business to the best of our ability, and, whether we are at the end of a long lane or have still some further distance to travel, this resolution will be a support to us, knowing that we have the confidence of the shareholders. Before sitting down, I beg to move that the thanks of the meeting be given to the officers and staff, who, after all, are the responsible persons to carry on the business.

The motion, having been seconded, was carried unanimously.

The SECRETARY (Mr. M'Leod), replying on behalf of the staff generally, said they had worked splendidly, and he was sure each member would much appreciate the vote, and take it as an encouragement in the hard six months that was before them.

The CHIEF ENGINEER (Mr. G. M. Gill) said he felt highly honoured in, for the first time, replying on behalf of the engineering staff. As he only entered the service of the Company at the beginning of the year, he could not speak of the work done during the past half year. But he could speak of the obligations they had to meet during the present war: and he thought the general result of the Company's working was highly creditable to all concerned.

South Metropolitan Gas Bill.—At last Tuesday's meeting of the London County Council, a recommendation of the Parliamentary Committee to oppose the South Metropolitan Gas Company's Bill was carried by the requisite majority; the cost of so doing to be met out of the county fund.

Atherton Gas Stokers' Wages Advanced.—The gas stokers employed at the Atherton Gas-Works recently asked for an advance in wages to 5s. 4d. per shift of eight hours, and requested that their war bonus should be increased from 1s. to 2s. per week. At the last meeting of the Council, the application was granted.

Launceston Gas Company.—The annual meeting of the Launceston Gas Company was held on Monday of last week—Dr. W F Thompson (the Chairman) presiding. The report stated that increased prices had occasioned the Board great anxiety. Owing to the price of gas having been raised during the year, the dividend declared was at the reduced rate of 6s. 9d. per share.

Co-Ordination in Street Disturbance.—Mr. Charles Jesson drew attention, at last Tuesday's meeting of the London County Council, to the manner in which, he said, streets were constantly being broken up by local authorities and companies to lay mains, &c. Referring to a thoroughfare in Vauxhall, he stated that the road had constantly been broken up—the chief offender being the South Metropolitan Gas Company. Mr. R. C. Norman, as representing the War Estimates Committee, remarked that they had suggested that steps should be taken to obtain co-ordination of activities in this respect between public bodies and companies.

BRENTFORD GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Friday, at St. Ermin's Hotel, Caxton Street, S.W.—Mr. RALPH J. NEVILLE NEVILLE, M.P., in the chair.

The SECRETARY (Mr. John T. Croxford) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the year they had just passed through had been one of great stress and difficulty for all of them, and following, as it did, almost directly after the new Act of Parliament, which came into force on Jan. 1, 1915, the Board had a very anxious time. Probably those present would remember that the Company's new Act and the Declaration of War became accomplished facts at about the same time; so that the Directors had passed through an extremely trying period, just when the Company were starting a new and large venture.

FREIGHTS AND COAL PRICES.

The chief difficulty that had been encountered was with regard to freights, and the enormous increase that there had been in the price of coal. The cost of coal had increased about 28 per cent., which represented a very large sum indeed; and, so far as one could see, it was likely that there was going to be a still further increase in the course of the coming year. The accounts were, he thought, extremely satisfactory ["Hear, hear"]; and he felt sure that the good men and true who laid the foundations of this Company years ago—like the late Chairman, Mr. Howard C. Ward and Mr. Ulick J. Burke—would have experienced the greatest satisfaction and gratification in seeing how well the work done under their control was now bearing fruit. The actual cost of coal had been practically met by the increase in the amount received for gas, meter and stove rentals, and residual products. It was really astonishing to see that the two amounts came to within £300 of each other. The income was £32,449 more than in the corresponding period of the previous year; while the extra cost of coal amounted to £32,720. The Company had also, of course, had other difficulties to meet. It had been necessary to hold enormously large stocks of coal; and anybody who knew how hard it was at the present time to foresee the course of both markets and freights, would agree that the Board were right in keeping this large stock, though under existing circumstances the step was a much more serious one to take than when prices and freights were normal. Another difficulty with which their Company, along with other undertakings, had been confronted was a big increase in the cost of labour and materials; and there was also the fact that there was not a free market for raising capital, but they had to go to the Treasury and get sanction to do so.

EMPLOYEES AND THE WAR.

To add to all the other troubles, they had lost a large number of their men. The contribution which the Company had made to the service of the Crown was one of which all concerned had every reason to feel proud. Out of about 1500 men, 497 had actually joined the Colours; while 250 more had been attested. So that practically 45 per cent. of the employees of the Company were in one form or another at the service of the Crown. This, he thought, was a truly magnificent statement to be in a position to make. Of the number of men who had gone, the proprietors would be glad to hear twelve had been thought worthy of Commissions—which was a great honour to the men and to the Company—and two of them had gained great distinction. One of them, Lieutenant E. W. Bennett, had got the Military Cross, and the other, Sergeant L. A. Titcombe, had been awarded the Distinguished Conduct Medal.

ASSISTING THE GOVERNMENT.

Besides all the things he had mentioned, the Company had put themselves entirely in the hands of the Government to do anything that was desired of them; and along with other gas companies, they had taken up the extraction of toluol, which was a new industry from their point of view, and one about which he would like to say a word or two. The extraction of toluol from the gas made a certain amount of difference—not a very large difference—in the heating and illuminating power of the gas; and, in consequence of this, the Ministry of Munitions sent round to all the local authorities, and published in the Press, a request that the authorities would not be too careful in marking what was amiss with the heating or lighting qualities of the gas. In doing this, the Ministry intended, of course, to help the gas companies, by asking people not to be too critical, because the toluol was in extraordinary demand for the purposes of the country. In many cases, no doubt, it had had this effect; but in some instances the result had been exactly the reverse. There were municipalities who said: "If you are going to take all this good stuff out of the gas, and make an extra profit, how are you going to compensate us for what we shall lose? We require compensation." Now, he wanted to make this point quite clear. So far as any profit was concerned, he thought they might take it that there was none at all. In fact, the proprietors could see proof of this, if they wished, in the accounts that were now before them. Under the heading of tar, it would be noticed that the increase in the amount of money they had received was only £35, although the quantity of tar made was substantially in excess of that made in the corresponding period of the previous year. This showed that there must be a considerable loss in connection with the toluol. However, the real fact which emerged was that, so far from the Company allowing their gas to go below the standard, they had enriched it, and had kept it up to the full statutory quality provided for in their Act. So far from the local authorities and other consumers having any grievance against the Company on the score of the toluol, the boot was, if he might say so, on the other leg. The Company had maintained the full statutory quality of the gas; while the shareholders, he was afraid, would look in vain for any profit in regard to toluol. Really, he did not think the Company had been treated quite fairly by some of the municipalities—who rated them, and some of whom competed with them by being the suppliers of electric light.

THE INCREASED PRICE OF GAS.

The Directors had, as would be seen from the report, increased the price of gas, as from Christmas last, 2d. per 1000 cubic feet. It was 24 years since the Company had raised the price of gas; and this, they would all agree, was an extremely creditable record. They were now the third largest Company in the London area; their output coming above that of the Commercial Gas Company, and next to that of the South Metropolitan Company. In the period he had named, they had never had occasion to raise the price of gas; but now it had become necessary. The future was full of uncertainty; and nobody could see what was going to be the condition of the tonnage and freight market, which at present was at a prohibitive level. In addition, there were the increased expenses in raw material, and in the cost of repairs, and other matters of this sort. However, he thought their rise in price was the smallest of any Metropolitan Company. It had also been longer delayed than the others; and he hoped it would see them through. So far as the shareholders were concerned, they were in rather a good position, because they had not been receiving the full amount of dividend to which they were entitled. The Company might have paid the amount of dividend allowed for an extra 1d.; so that now the shareholders would only be affected to the extent of 2s. and 2s. 6d. on the "A" and "B" stocks. He hoped that it would not be necessary to make any further increase.

THE ACCOUNTS.

Turning to the accounts, it would, of course, be seen that there were differences between the present ones and those for the corresponding period of the previous year. He had referred to the additional cost of coal being practically balanced by the extra receipts. Then there was the item of wear and tear, which was rather more on this occasion. The figure was £1664 up. The fact was that the half of the year now being dealt with was always an expensive one in this respect. There was also included in the item on the present occasion the toluol extraction plant; and there was the increase in the prices of materials. Therefore the figure in the accounts seemed to be quite a fair one. There was no other figure on the expenditure side of the revenue account with which it was necessary for him to deal, until he came to the items active service allowances and war bonus. These were new, and together they amounted to £9392. As against this, if the proprietors would look at the savings that had been made under the head of distribution—salaries and wages, and repairs and renewals of mains, meters, and stoves—they would see that there had actually been a saving of £9393; so that the new items on the one side and the savings on the other practically balanced—they were within £1 of each other. This spoke volumes for the skill of their Engineer and Manager (Mr. A. A. Johnston) and other officers, to whom they owed so much at the present time. The next items were in favour of the account, as compared with the corresponding one. On parliamentary charges there was a saving of £478o; and management cost about £700 less, due to the fact that now the other Companies who were amalgamated had come in, and there had been certain savings on salaries.

A YEARLY MEETING.

Before leaving this portion of the accounts, he might refer to the notice in the report about holding only one general meeting of the proprietors each year. Now, the amount of surplus they had in the June half year was £11,212; whereas on this occasion it would be noted they did not make the dividend and interest by £7720. There was thus a difference between the two half years—though both were equally skilfully managed—of nearly £19,000; and if they put the two together, they would see that there was really a surplus on the year's working of £3492 over the dividend. To obviate the difficulties that arose both on the Stock Exchange and in other places where these things were looked at, they proposed to have only one meeting of proprietors annually. People who might think the Company were doing very badly with a deficit of £7700, would forget that there had been a surplus profit in the first half year of £11,000; and so the shares might be affected. In having one meeting, they would be following in the footsteps of the railway and other great companies. It would not affect the question of interim dividends, nor the auditing of the accounts. There would be exactly the same accounts; but they would not be published. For any shareholder who wanted to see them, however, they would be available.

AN INCREASED CONSUMPTION.

The profit and loss, which was the next account, explained itself; and he did not think there was anything arising out of it. Certain amounts had been written-off investments, which was due to the Official Auditor. The special purposes fund had also been written-down to a better level; and, according to the Official Auditor, they would have to write it down still more. There was an increase in the quantity of gas sold of nearly 4½ per cent., which was very satisfactory; and there was also an increase in the number of consumers in the old Brentford district of 2 per cent. If the Company had the capital, and it was not war time, the proprietors would see a very large increase both in the number of consumers and in the make of gas; but the Board had to husband their resources, and therefore they did not undertake any more new construction work than was absolutely necessary. In fact, the Government refused to allow them to. From the balance-sheet, it would be seen they had an overdraft of £12,000, even with the £143,000 subscribed by the shareholders, which was one of the most successful financial operations the Company had ever conducted. It had been accomplished without any payment to a financial house; and the confidence of the shareholders could not have been better expressed than by giving the Board £143,000 out of the £150,000. The balance was being absorbed in small amounts; and he felt sure that very shortly there would be none left. On the credit side of the balance-sheet, stocks figured at £124,943, which was about £23,000 more than for the corresponding period. In addition, there were gas accounts due to the Company amounting to £86,000; and there was outstanding a sum of practically £228,000, which was a very large sum, when the capital of the undertaking was considered. This was where the difficulty came in—floating capital; and every gas company had found the trouble of

that. It was adding to the cost of carrying on the business. The expenditure on capital account during the past half year amounted to £11,358, which was practically all dividend-earning—mains, stoves, &c.

A LOW CAPITAL.

He thought they would be glad to know that the capital per 1000 cubic feet of gas of this Company still remained within a fraction of a penny of what it was before the £143,000 was issued; and he believed it was to-day the lowest capital per 1000 cubic feet of any Metropolitan Company. This position was a great source of strength to the undertaking, and was one of the things on which his predecessors in the chair had laid the greatest stress. He congratulated the shareholders upon the position the Company occupied to-day, and the way in which it had borne the strain of a very difficult year. So far as he could see—though there were great difficulties ahead—if they could continue to carry on the way they had during the past year, the Directors would not be ashamed to meet the proprietors twelve months hence.

Sir ROBERT SHAFTO ADAIR, Bart., formally seconded the motion.

EXPRESSIONS OF APPROVAL.

Mr. A. B. BOSHER congratulated the Board upon the very excellent report, and the Chairman upon his illuminating address. Considering the terrible times they were living in, it was somewhat remarkable that the Company should have been able to show an increase in gas sold of 4½ per cent. He was fully in agreement with what had been said as to the holding of annual meetings. Not only would this course save both money and time, but it was also falling into line with the railway companies. It would not disturb in any shape or form any monetary or market operation that might take place in the stock. Gas and all other undertakings, in fact, whose principal usable article was coal were now passing through a very severe crisis; but it had to be faced, and he had no doubt with the skill and care which had always been exercised in the management of the Company they would pull through with the least possible inconvenience. At any rate, he felt, as an old shareholder, that the proprietors were most excellently served both by the Board and the General Manager and staff. Not only were the Directors men who were thoroughly devoted to the Company's interests, but what was of equal, or even greater, importance, they were a capable, shrewd, and level-headed body of men.

PATRIOTISM OF THE GAS COMPANIES.

Mr. H. D. ELLIS, referring to the stock of coal, said he was sure that he and all present who were practically associated with gas companies would entirely concur in the views of the Board that it was absolutely incumbent upon them to see that they did not fall short in their stock of coal. They were to be congratulated heartily on having provided so well for this. As to the capital, he was much pleased to hear the remark that the Company still retained their pre-eminence among Metropolitan and Suburban undertakings, and by a very substantial figure. He thought he was right in saying that their capital was only about £360 per million cubic feet of gas. This was a position which neighbours might well envy them. The percentage of employees who had responded to the call on them constituted a splendid record. The Chairman had stated that the Company were not likely to get a profit from toluol extraction. This, he was sorry to say, was the case. In fact, some neighbours, he believed, so far from realizing a profit, were making a loss; and he did not think that what the gas companies had done had been properly appreciated by the municipalities of London. They did not appreciate the patriotic action of the gas companies. Though, perhaps, these bodies were composed of sober, level-headed, business men, in respect to most of the commercial transactions of the world, it was only necessary to say "gas company" to many of them, and they saw red. One would never persuade them that a gas company was honest, much less patriotic. But he would like to go further. Not only had the gas companies been making toluol, at best at a bare profit, and probably some of them at a loss, but they had given an additional proof of devotion to their country, because, at the request of the Government, they had been supplying sulphate of ammonia at considerably below the market price. Owing to the scarcity of nitrate of soda and other fertilizers, the Government put it to the companies that they should restrict their general sales of sulphate, and reserve for the benefit of British agriculturists a certain proportion, in order to stimulate and promote to the utmost the production in this country of wheat, &c. He thought he might say they were selling in December sulphate of ammonia to the Government, or the Government's nominees, at a rate fully equal to £2 below the market price. The price to the Government was £14 10s. per ton; and he believed at some period of the time the market price was £16 10s. Was not this patriotic, and were not the companies entitled to pat themselves on the back?

The CHAIRMAN: You are below the mark. The market price was £17 10s. per ton.

Mr. ELLIS (continuing) said he could only see one objection to yearly meetings—that they would miss each year one of these delightful gatherings. The present meeting was the most crowded he had seen; and he assumed that others had come for the same purpose as himself—to express not only their gratitude to the Board for the way in which they had managed affairs, but their heart-felt sympathy with them in the anxiety they must have undergone since the last meeting.

Mr. R. W. EDWARDS remarked that the position might be summed up in a few words—a capital ratio of between 7s. and 8s.; an increase in the sales of gas of 4½ per cent.; the increase in the coal account balanced on the revenue side; and the dividend for the year earned, with a balance carried forward. Such a situation required no further recommendation. It spoke volumes for the Company. He joined with the other speakers in congratulating the Board.

The report and accounts were then unanimously adopted.

CONCLUDING BUSINESS.

On the proposition of the CHAIRMAN, seconded by Sir R. SHAFTO ADAIR, dividends for the half year ended Dec. 31 (subject to income-tax) were declared at the rate of 5 per cent. per annum on the preference stock, £5 12s. per cent. per annum on the "A" consolidated stock, and 5½ per cent. per annum on the "B" consolidated stock.

The retiring Directors (Mr. J. Milne Watson and Mr. William Mann) were then re-elected, on the motion of the CHAIRMAN, seconded by Sir R. SHAFTO ADAIR; and the Auditors (Mr. Monier F. Monier-Williams and Mr. Alfred Bevis) on the proposition of Mr. W. EDGAR.

A hearty vote of thanks—proposed by Mr. J. ENNIS and seconded by Mr. J. REESON—was passed to the Chairman, Directors, and officers of the Company, for their conduct of the business.

The CHAIRMAN, in acknowledgment, remarked that they had lost a very large number of their staff; and there was nothing more pleasant than to reflect on the fact that many old men who had earned their retirement had offered themselves to help the Company in their difficulty. They were doing very good work; and so had the women who had come forward. Nothing but the very highest praise could be bestowed upon the manner in which the officers had worked. The Company was going to be one of the very best in the Metropolitan area. They had a large undeveloped district; and if they went on on the lines that had been laid down, the undertaking should occupy a pre-eminent position in regard to its stock and others matters, when once the public came fully to understand what the position really was.

THE SERVICE OF THE COUNTRY.

Mr. ELLIS moved: "That this meeting records its hearty thanks for, and appreciation of, the services both of the members of the staff and of the workmen who have enlisted in the service of their country, and have done duty by sea and land, thereby covering themselves with glory; and expresses deep sympathy with the relatives of those who have fallen." He said he thought that every man who had fought in this war had become a hero.

The CHAIRMAN: 31 of our men have fallen.

Mr. BOSHER, in seconding, said their hearts must go out in gratitude to these men, as they should do to all those fighting at the front.

The resolution was cordially passed; and the meeting separated.

SOUTH SUBURBAN GAS COMPANY.

The Ordinary Half-Yearly Meeting of the Company was held last Friday, at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES HUNT in the chair.

The SECRETARY (Mr. Wilfrid Wastell) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

COAL CONTRACTS AND DELIVERIES—PRESENT AND FUTURE.

The CHAIRMAN, in moving the adoption of the report and accounts, said: To begin with, I am very glad to be able to say that, unlike last year's experience, there has not been any difficulty worth mentioning with regard to coal supply throughout the winter which is now drawing to a close. This is largely to be attributed to the reduction of winter deliveries made possible by the exceptionally heavy stocks accumulated during the summer months; but it is also a great pleasure to be able to acknowledge the due fulfilment, notwithstanding occasional delays incidental to the enormous increase of railway traffic consequent upon military operations, of such current deliveries as had to be contracted for. This improvement in deliveries is a matter for congratulation; but when our thoughts turn—as they have to do at this season of the year—to the obtaining of fresh supplies, the prospect cannot be considered satisfactory. The increase of home consumption, and continued, if not increased, shortage of men at the pits, have not eased the situation; while as to prices, safety seems to lie only in the somewhat precarious operation of the Price of Coal Limitation Act. But it is only fair to say that, in the application of the Act to existing contracts, the Company have been fortunate in having had to deal with contractors whose recognition of the position enabled them to offer a comparatively substantial reduction from their contract price; and although the tonnage affected by the reduction does not happen to be considerable—the only contract concerned not being a large one—it is not on that account less pleasing to acknowledge the spirit in which we were met.

OVERSHADOWING FREIGHTAGE.

Just now, however, the cost of freightage almost overshadows all other questions in connection with coal supply—not only because it directly affects the cost of procuring seaborne coal, but also from its indirect effect on that of coal which is railborne. During mid-winter, freight charges returned to the very startling figures to which they rose about a year ago; as much as 16s. 6d. per ton having been actually paid—the present figure being about 15s. This compares with a cost in normal times of 3s. or a little less; while, under the present wholly abnormal conditions, the cost, according to very excellent authority, is not more than from 4s. to 5s. per ton. The difference between this and 15s. represents about 10d. per 1000 cubic feet of gas sold, quite apart from the exceedingly high price which has now to be paid for coal at the pit mouth. The Directors have, therefore, felt it to be incumbent upon them to represent to the Board of Trade the great gravity of the position, having regard to its very injurious effect upon all interests concerned. I am sorry to say that, so far, no remedial measure has resulted from this representation; but we are not without hope that something may be done by the Committee which was recently appointed to consider the question. It is scarcely conceivable that there is no remedy for a state of things which, it is no exaggeration to say, spells "disaster;" that no sort of Government control is practicable. But supposing this to be unfortunately the case, at the very least it can hardly be beyond the power of the Government to give up to the consumer the share of the excessive charges which is to come to them as taxation of war profits. This would be a much more justifiable course than to inflict it upon the consumer—for it has to be passed on to him—at the very time when he is being urged by the Government to burn more gas. Moreover, it will hardly be denied that excess profits made at the expense of the consumer, whether it be of gas, electricity, coal, or provender of any kind, are in a different category from those which are derived from trades or manufactures directly arising out of the war; and, inasmuch as they may entail real hardship, ought, as far as practicable, to be returned to their source. There may be difficulty in doing this in every case; but hardly in that of the gas consumer, since such portion of excess profits as may be handed over to the gas under-

taking by which he is supplied would for the most part, by the operation of the sliding-scale provisions, automatically reach him.

POSITION OF RESIDUALS.

The coal bill for the half year is, as was to be expected, the heaviest recorded in the history of the Company, although helped by remainders of contracts for both coal and oil at lower prices than those which are now ruling. Fortunately, there is a fairly substantial set-off in the increased receipts for residuals; coke in particular showing a remarkable recovery from the depression which prevailed during the corresponding period of the previous year. The effect of this recovery is highly gratifying, as evidence of the elasticity of this source of revenue even in what may be fairly described as mainly a residential area, the needs of which as regards coke supply are of themselves insufficient to keep the yards clear, and have to be supplemented by those of customers at a distance. A good deal of difficulty has been experienced this winter in reaching these customers, owing to congestion of railway traffic. There has also been difficulty in delivering by road, in consequence of scarcity of conveyances. Nevertheless the yard and road sales show a very satisfactory increase over those of the previous year. It is, I need hardly say, particularly desirable to foster such sales, as being very largely among householders; and the leaflet issued last autumn by the Parliamentary War Savings Committee, urging the use of coke in households as a substitute for coal, came as a very welcome support to the efforts of the Company in this direction. The circulation of this leaflet throughout the Company's area of supply was at once undertaken, and, it is believed, with beneficial effect. The advice given in it is so much to the point, and is, moreover, so entirely borne out by experience, that I do not make any apology for repeating, it in the hope that proprietors may be able to assist in extending the use of this fuel as recommended. It is simply as follows:

> Coal and coke mixed in equal proportions give a fuel which will last longer than coal alone. Though the fire will not blaze to the same extent, it will give a steady red-hot fire.

The bye-product which is next in importance—namely, ammonia, in the form of sulphate—has also much improved in value; the price now ruling for it being the highest reached for more than thirty years. This is accounted for by the absence of German competition; difficulty in obtaining nitrate of soda, owing to scarcity of shipping; and Government requirements for munition purposes. The endeavour which is now being made by the Board of Agriculture to extend the use of this fertilizer by British agriculturists gives, it is to be hoped, good promise for its future. This will receive our hearty support, even though the pecuniary advantages of the home market may not become immediately apparent. It is indeed high time that the economic superiority of this home product should prevail over the foreign product which has hitherto been so largely used. It seems a little strange that of the three principal bye-products of gas manufacture, the one which is most in request for supplying the very urgent needs of the time is also the only one which has not, to the ordinary producer of it, improved in value since the outbreak of war. Not only so, but the demand for tar, which is the bye-product in question, is diminishing rather than increasing, consequent, appparently, upon the difficulty under existing circumstances of dealing with the solid residuum—pitch—resulting from its distillation. It is not easy to understand why, this being the case, greater effort is not being made in the manufacture of the briquettes (composed of coal dust and pitch as the binding material), the use of which is also, as well as coke, recommended by the Parliamentary War Savings Committee as a substitute for coal. One would have thought that so promising a means of eking out the present scanty supply of coal would, in this time of national stress, be worked, so to speak, for all it is worth. Anyhow, the tar distiller is badly in need of additional outlets for his large and increasing stock of pitch, which, although possessing economic value, is at the present time practically unsaleable, and threatens by its accumulation to interfere with much desired development in other directions. Possibly more may be heard of a recent proposal to utilize it for gas making mixed with coal. There is one outcome of the necessities of the times, which may ultimately lead to more being done in connection with the working-up of residuals *in situ*. I refer to the dehydration at the gas-works of tar intended to be used for road purposes, by which most of the light oils are secured for further treatment and extraction of toluol, instead of being wasted, as is the case when crude tar is prepared for use at the roadside. Thus in many cases where the only idea has hitherto been to sell the crude product to the best advantage, the first step in its distillation is now being taken, perhaps to be followed by a more complete process on the return of normal conditions.

FINANCIAL RELATIONSHIP OF RAW MATERIALS AND RESIDUALS.

As in the expenditure for coal, so also in receipts for residuals, this half year establishes a record. They amount to £57,888, and exceed those of the next highest, which are for the second half of 1912, by £3392. For the latter period, however, the coal bill was less by £30,057—a difference between the two periods of nearly 7d. per 1000 cubic feet, which practically represents the present increase in the price of gas. In fact, anyone who cares to follow from half year to half year the figures relating to cost of coal on the one hand and receipts for residuals on the other—noting carefully the proportion which the one bears to the other—will be following very closely indeed the varying fortunes of this undertaking. If one may judge from the experience of the last seven years, he will soon find for himself how very varying these fortunes are; for during that period alone, the proportion which receipts for residuals has borne to cost of coal has ranged between 48 and 90 per cent. In the present half year, with figures for both coal and residuals higher than ever before, the cost of the raw material has only been covered to the extent of about 55 per cent. by sales of bye-products.

OTHER FEATURES OF THE ACCOUNTS.

It was quite to be expected that in other directions working expenses should show substantial increases, since materials of all kinds are now costing much more than in normal times. Nor will the proprietors, I feel quite sure, be in the least disposed to grudge the expenditure of £4677 on war bonuses and allowances—an amount which, by the way, is likely to be considerably exceeded in the current year. What all are much more likely to regret is the reduction of bonus payable to co-partners by no less an amount than £1400. This reduction follows upon the increase in the price of gas, which, operating as it has done throughout the whole of the half year, has brought in about £25,000, or somewhat less than the amount of the statutory dividend of £4 16s. 8d. per cent., which, as proprietors are aware, is also governed by the price of gas, and is reduced accordingly. This dividend—which is at the same rate as last half year—if approved, will, with the help of the Company's bankers, be paid at the usual time; and I may take the opportunity of pointing out that the position in this respect—namely, the increased indebtedness to the bank as shown by the balance-sheet, of £70,000 as compared with £65,000 a year ago, or with £25,000 last half year—is primarily due to our exceptionally heavy stocks of coal and oil at war prices. The total of all the stocks is larger by £28,536, as compared with that of a year ago, and by £20,329, compared with that of the previous half year. It may also be pointed out, as accounting for an inevitable increase of indebtedness in the second half of the year, that, during this period, only the gas-rental for the two summer and lighter quarters is available for collection; whereas the first half of the year gets the advantage of the larger collections for the two winter quarters—the difference between the two collections being very considerable. This temporary addition to the working capital—for it may only be temporary—is not to be regarded as indicating a less favourable financial position, which it is our aim to strengthen as much as possible. It will be recollected that the possibility of converting the Company's investments in Consols into War Loan Stock was considered when the conversion scheme was first made public, but was not at that time found to be practicable. Since then market conditions have intervened, and, as will have been seen from the report, the conversion, which should result in an increase of revenue, has now become an accomplished fact. Other investments, much smaller in amount, have at the same time been written-down, so that the amounts now standing to the credit of the two funds respectively represent as nearly as possible market values.

THE GAS BUSINESS AND WAR REQUIREMENTS.

Having regard to the almost complete discontinuance of both public and outside shop lighting, shorter hours generally, and the undoubted exercise of economy by many private consumers, an increase notwithstanding of about 1 per cent. in the gas sales can hardly be considered as unsatisfactory; for it shows that, even in spite of particularly adverse conditions, gas, owing to the great variety of uses to which it may be applied, is capable of holding its own. Indeed, the development of the undertaking continues to proceed apace, the number of consumers added during the half year having been greater than the average of the two preceding half years, although, owing to the operation of the slot-meter system, which brings in a large number of comparatively small consumers, we are sharing the common experience that increase in the numbers of consumers means a reduction in the average consumption per consumer. Thus, with an addition during the last three years of upwards of 10,000 new consumers, or 17 per cent., there has been a falling-off in the average consumption per consumer of about 10 per cent. A further indication of continued development is the large number—3393—of cookers, fires, and other heating appliances added during the half year. For these, the demand has continued practically unabated; ability to supply having, however, been somewhat hampered by difficulty in obtaining, and also by shortage of men to fix, them. Here again we have to thank the leaflet to which I have already referred—this time for a recommendation to the public to "use gas whenever possible for cooking purposes." Notices have also appeared recently in the Press urging the more extended use of gas for both lighting and heating as "a patriotic duty." All these recommendations are with the object of saving coal and of securing an increased supply of the bye-products on which so much of the success of the war depends; and they testify to the economic advantage of the treatment of coal as practised by the gas manufacturer. As you are no doubt aware, efforts are being made throughout the country to obtain from the gas-works as large a supply as possible of these bye-products; and in these efforts, I feel myself free to say, our much esteemed colleague, Mr. Carpenter, has taken a very distinguished and successful part. But this great contest of resources in which the Allies are engaged demands more, and always more, of the materials by which alone it can be brought to a successful issue. Hence the appeal of the Government to householders to use less coal and more coke, or gas, or both, so that the gas-works output of residuals may be thereby increased. There can be little doubt as to what the answer to this appeal will be, when once it is realized how much depends upon it. But it is to be hoped the Government will do their part by bringing down freight charges so as to make it possible to continue to supply gas at reasonable rates.

LOYALTY TO COUNTRY AND COMPANY.

There is one other matter on which it is a great satisfaction to be able to dwell if only for a moment. I refer, as may be supposed, to the continued goodwill and loyalty of the Company's employees of all grades, which have contributed in no small degree to the smooth working of the undertaking in these exceptional times. We are all proud of the large number who are serving with His Majesty's Forces; and I may take this opportunity of saying that the Directors had great pleasure in carrying out the suggestion made at the last meeting to send to each of them a Christmas greeting and gift, in acknowledgment of which many appreciative letters have been received. The point, however, that I should like to make is that the withdrawal—I hope but temporary—of so large a number as stated in the report, and whose replacement for the time being is a matter of very great difficulty, adds considerably to the work and anxiety of many of those who are left behind; and it will be readily understood that there have been times when the present all-round shortage has been greatly felt. So far, however, all obligations have been fully met with a readiness and cheerfulness which are most creditable to all concerned; and the Directors have much satisfaction in recording their appreciation of this effective and sympathetic co-operation.

EFFECT OF FREIGHTS ON PITCH SALES.

Mr. CHARLES CARPENTER, D.Sc., in seconding the motion, said he was sure the proprietors were all very much indebted to the Chairman

for the clear and lucid manner in which he had set out the results of the half-year's working, and had, in addition, ably elucidated those facts which appeared in bald form as figures in the balance-sheet and sentences in the report. The Chairman had properly drawn attention to the important question of freights; and it was this freight question that pervaded the whole atmosphere of gas making to-day. Mentioned also by the Chairman was the low value which was being received for tar, by reason of the fact that pitch was so largely a drug on the market. Pitch was badly wanted for briquette making by two of their Allies—by the French and by the Italians. He need not remind those who had travelled much on the Continent how largely briquettes were used both for locomotive and marine purposes. But the tremendous cost of freight (which was something like ten times the normal) made it practically prohibitive to export pitch now. Its value here—its intrinsic value—was high, because its worth was approximately proportionate to that of coal. But the whole difficulty arose from the fact that it could not be exported. He thought the Government were bound to take this matter in hand, because there were grumblings and discontent on, for instance, the part of the Italians, over the high cost that was being charged for freight; and the high figures that were being taken by the English shipowners (there were others as well) in the way of profit was being looked at by the Italians as being not altogether the best expression of brotherly affection. If the Government would only take this matter in hand, they would ease the situation enormously, and in the only direction in which he thought it was possible. The coal question was bound-up with that of the shortage of labour. This the Government had tackled by fixing a price beyond which coal charges were not allowed to be increased. And although the figures at which the charges stood were very high, yet they were much less than the prices at which the Company's requirements had been met, but which were considerably lower figures than the market price to-day to those who were not similarly placed. There was one other feature of satisfaction in the report. Despite the enormous reduction in lighting, owing to the restrictions on shop and street lighting, there was an increase of 1 per cent. in the quantity of gas sold. He mentioned this fact, because it reflected considerable credit upon the activities of the portion of the staff whose particular duty it was to extend their business as gas sellers. As the proprietors knew, the staff of a gas company was different now from what it was for very many years. They had not only a skilled organization to make gas, but they had to have a skilled organization to sell it. He thought it was very creditable that the consumption of gas had in these times increased even by what might appear the small amount of 1 per cent.

The motion was unanimously carried.

Dividends Declared.

The Chairman moved the declaration of dividends at the following rates per annum: 5 per cent. on the preference stock, 4⅞ per cent. on the ordinary stock, and 4⅝ per cent. on the West Kent ordinary stock, all less income-tax.

Mr. W. G. Waller, in seconding the motion, took the opportunity of thanking the proprietors on behalf of the co-partners at the front for the presents sent to them at Christmas. From the letters received, it was seen that this little attention was greatly appreciated.

The motion was unanimously adopted.

Freights a Question of International Importance.

Sir J. Fortescue Flannery, Bart., M.P., said it was a pleasure to move the re-election of the two retiring Directors—their Chairman (Mr. Charles Hunt) and Mr. Charles Carpenter. In doing so, he should like to re-echo the remarks of Mr. Carpenter as to the complete and lucid statement which had been made by the Chairman. The key-note of what the Chairman had said, and of what Mr. Carpenter had said, was the question of freights. This was a matter of the utmost international importance at the present time, and it was one which, unless grappled with, would increase in international importance, and perhaps have a more widespread influence than even its effect on the gas trade. It was nearly eighteen months since he, for one, as interested in the gas industry, raised the question of freights in the House of Commons; and the immediate result of the question being raised, by others as well as by himself, was to produce some influence by the Board of Trade, which did result for a time in an improvement in the freight arrangements from the coal trade point of view. Certain German ships which had formerly been lying idle after capture were released, and were used in relief of coal transport from the North to the southern gas companies and others. This was a palliative for a short time. The state of things, however, in respect of the carrying of coals, was now as bad as ever, and a great deal worse in some other trades. The Chairman had referred to the question of excess profits. This raised an important point, which even to the shipowners might lead to some concept, and then to some agreement with the views of users like the gas trade. The proprietors were aware that, under recent legislation, those who made profits greater than they made in times of peace had to pay one-half into the Exchequer under the guise of what was known as the excess profit tax; and some of the shipowners had very large sums indeed to account for to the Treasury—indeed, many millions would be collected by the Treasury from the mercantile marine of the country. Now the grievance of the British shipowners was that their competitors, neutral shipowners in Holland, Sweden, and Norway received the same high freights, with this difference—that the neutral shipowner was able to keep the whole of the profits arising from the high freights, whereas the British shipowner had to surrender one-half of them, by way of taxation, to the Government. The British shipowner realized that, when the time of peace and normal competition returned, the neutral shipowner would be subsidized by the accumulations of these large sums which he was able to keep in his own pocket, but half of which the British shipowner had to surrender to the Government. Therefore, he (Sir Fortescue) believed that, if the suggestion the Chairman had made was carried out, and the Government were to directly and definitely intervene in this question of freights, many of the British shipowners would welcome the intervention on the ground that it would restore in times to come equality and justice as between the British shipowner and the neutral shipowner. He hoped he had made the point clear, and had succeeded in interesting every one of his co-partners in the concern, so that they might use their influence in the direction indicated by the Chairman. One other point he would mention was as to the manner in which the bye-products had come to the rescue of the Company, in relief of the enormous increase in their expenditure upon coal and other matters. They should not let the gas consumer suppose that the whole burden had fallen upon him; on the contrary, he had only had, during the half year, to bear about half the burden in comparison with the increase of expenditure. Comparing the period just closed with the corresponding half of 1914, the increase in expenditure had been in round figures £47,000. Where had this £47,000 come from? Of it, £25,000 had come from the increased yield of the gas sold; and £22,000 of it had come from the increased yield of residual products. He emphasized this point, if he might be allowed to do so, because he wanted the gas consumer to realize that the Company had only called upon him for little more than one-half of the extra expenditure. Before moving the resolution as to the retiring Directors, he wanted to speak of two other colleagues. They had with them that day for the first time Sir John Boraston. They used to have Mr. Boraston with them, and had always welcomed him. As Sir John Boraston, they were still glad to see him in his accustomed place, and were pleased to be able to congratulate him upon the well-deserved honour which His Majesty had placed upon him. [Hear, hear.] Then Mr. Alexander Dickson was unfortunately absent through illness; but he hoped to resume his duties at the next Board meeting. As to the retiring Directors, they had in Mr. Hunt and Mr. Carpenter two of the most successful and distinguished gas engineers that the gas profession possessed, and in this they were exceedingly fortunate. It was a privilege to move their re-election.

Mr. B. R. Green, in seconding, said the proprietors, in passing this resolution, would be promoting the best interests of the Company, particularly at a time like the present, when difficulties and problems the like of which had never been experienced before called for the most able guidance and control.

The motion was cordially passed.

The Chairman and Mr. Carpenter having replied,

On the proposition of Mr. Fisher, seconded by Mr. R. Garraway Rice, Mr. Samuel Wood, F.C.A., was reappointed to his office as Auditor.

Moved by Mr. C. E. Nuthall, and seconded by Mr. Garraway Rice, a hearty vote of thanks was passed to the Chairman and Directors, the Engineer (Mr. S. Y. Shoubridge), the Secretary (Mr. Wastell), their staffs, and the workmen. Mr. Nuthall also embodied in the resolution, that the heartiest greetings from the proprietors, and a wish for a glorious return home, should be sent to the employee co-partners at the front.

The Chairman, in the course of his reply on behalf of all included in the resolution, said that the desire of the proprietors regarding the men at the front should be complied with.

NEWPORT (MON.) GAS COMPANY.

Moving the adoption of the report and accounts at the half-yearly meeting of the Company held on Monday of last week, Mr. George Geen, J.P., expressed regret that the Chairman (Dr. H. M. Brewer, J.P.) was not well enough to be with them. Dealing with the business, he said, notwithstanding the mild winter, early closing, lighting restrictions, and the very few new houses that were being built, all classes of consumers for lighting, heating, power, and industrial works had increased their consumption by more than 7,000,000 feet over the corresponding half year, which was equal to nearly 4 per cent. Considering all things, he thought they would agree that this was fairly satisfactory Coals had cost £5100 more. Materials, wages, incidentals, separation allowances, and war bonuses had cost £2173 more. The consumers for a period of nine months had the benefit of coal contracts at pre-war prices. Then the Company were obliged to raise the price of gas 20 per cent., which was about equal to the increased cost of coal only, as the increased prices of gas produced £5277. Coal advanced in price by 70 per cent. when they made their last contracts; but the Price of Coal Limitation Act fortunately came to their aid and brought the figure down to 30 per cent., as against 20 per cent. increase in the price of gas. They hoped it would not be necessary to again increase the price of gas. They certainly would not if coal kept at its present rate. With regard to residuals, there were still considerable demands for shipments at better prices for coke, which, together with tar and ammoniacal liquor, showed an improvement of £3257. Coke sold for local domestic consumption in small quantities remained at the pre-war prices, in order to encourage the poorer people to use it as much as possible. The recovery of toluol retained its efficiency, thanks to their very able Manager, Mr. J. H. Canning, who introduced certain improvements that enabled him to get a larger percentage of this valuable commodity. In producing toluol gas companies obtained no financial advantage; but it was a patriotic endeavour to keep pace with the country's needs in the matter of high explosives. Following the precedent of last half year, when substantial amounts were written-off investments, the Directors had written-down the War Stock held by the Company to 96½ per cent., representing £538. He thought they would agree that altogether the revenue account was very satisfactory. They had cleared just enough to pay their statutory dividends, which was not so in previous half years of the war period. They carried to the profit and loss account £8570, against £7605 last year. He thought the Directors were justified in regarding the financial position of the Company as very sound. He wished to pay his tribute to the exertions of the staff during these troublous times to keep the works and the commercial side of the business in thorough working order, which had meant the closest attention. Mr. Canning, senior (the Engineer), Mr. Canning, junior, and Mr. T. H. Hazell (the Secretary) had had to work many hours overtime to keep pace with their difficulties.

The report having been adopted, and the statutory dividend of 5 per cent. per annum declared, votes of thanks were accorded to the Chairman, Directors, and staff. Responding, Mr. Hazell said the Board had made arrangements for the positions of the patriotic members of the staff who had gone to serve their country being reserved for

them, if they wished to return at the close of the war. Mr. T. Canning remarked that he hoped the plant which the various undertakings had laid down for producing toluol would not be swept aside after the war. The material was the direct material prepared ready for the making of aniline dyes, an industry which the Germans captured from this country, and which this country ought to endeavour to recapture. He added, in reply to a question, that it would not be at all advisable for a company of the size of Newport to provide plant for the manufacture of dyes; it was a delicate and expensive process But inasmuch as the halfway house had been reached, and gas companies all over the kingdom were prepared to send out direct material for the manufacture of dyes, it ought to be very much cheaper than formerly for those who chose to go in for making the dyes. The suggestion of an association of producers was certainly practicable.

CAMBRIDGE UNIVERSITY AND TOWN GAS COMPANY.

A falling off of 4·8 per cent. in the production and sale of gas was announced by the Chairman (Mr. E. H. Parker) when presiding at the half-yearly meeting of the Company last Tuesday; but he added that, considering the times, the accounts must be regarded as satisfactory. A great deal of the lessened output was accounted for by the decreased street lighting and the number of houses that had been shut up. The other side to the question, he said, was the increased use of gas-fires, cooking-stoves, and appliances for heating water.

The profit from the sale of coke and ammoniacal liquor had increased; but the receipts from tar had decreased. There seemed to be considerable misunderstanding in some quarters as to the value of tar to-day. It was true the value of the lighter oils had increased; but when it was remembered that from 50 to 60 per cent. of the tar was composed of pitch, and that owing to the closing of the Belgian and French markets which were the main outlets, pitch was now a drug in the market, and only a very small proportion of it could be disposed of at all at the present time, it would be seen that the Company had not benefited. With regard to the production of toluol, the Company were doing all that was possible to assist the Government, and with this object in view had had to incur considerable outlay in providing the necessary plant at their own expense. The tar distillers, however, did not encourage them to believe that the profits from the toluol, &c., would compensate for the low value of the pitch. The illuminating power had not suffered to any appreciable extent by the process adopted to extract the toluol from the gas. It had been suggested that the price of coal had been reduced by the Limitation of Coal Prices Act; but here, again, there was a misapprehension, as the collieries were allowed by the Act 4s. per ton over contract prices for the period June, 1913, to June, 1914. But their contracts for 1913-14 were 1s. per ton over the 1914 prices. This meant that the collieries were allowed 5s. per ton over the 1914 prices, besides which they got 50 per cent. increase in the rates for waggon-hire. Consequently the Act failed to assist the Company materially. They had been in negotiation with the borough authorities with regard to the charge for public lighting, and had come to an arrangement which the Directors were given to understand was considered reasonable and fair. At any rate, the Board endeavoured to deal with the matter in a liberal spirit. The Company were again indebted to their Manager (Mr. J. W. Auchterlonie) and to the whole staff for the satisfactory results which had been obtained.

The report and accounts for the six months ended Dec. 31 were adopted; and the usual dividend was declared.

Extended Lighting Restrictions.

The Home Secretary has made an order extending to the central and north-western areas of England the restrictions on public and private lighting in force in the eastern and south-eastern counties. The restrictions had already been applied, on the advice of the naval and military authorities, to certain places of special importance in the Midlands, Lancashire, and the West Riding; but experience gained from the last Zeppelin raid shows that their extension over the whole of these areas is a necessary precaution. The order comes into force on the 16th inst.; but it is very desirable that in the meantime every effort should be made to comply with its provisions. Among the provisions are the extinction of all external lamps except such public lamps as are approved by the Chief Officer of Police, and the reduction of other lights to the minimum intensity consistent with safety. In case of sudden emergency, all instructions as to the further reduction or extinction of lights given by, or under the direction of, a competent naval or military authority or the Chief Officer of Police shall be immediately obeyed. The order shall apply as follows: From half-an-hour after sunset till half-an-hour before sunrise, in the portions of the counties of Northumberland and Durham to which the Lights (East Coast) Order does not apply, and in the Administrative County of the Soke of Peterborough. From one hour after sunset till half-an-hour before sunrise, in the portion of the North Riding of Yorkshire to which the Lights (East Coast) Order does not apply. in the West Riding of Yorkshire, and in the counties of Derby, Nottingham, Leicester, Rutland, Northampton (except the Soke of Peterborough), and Buckingham. From one hour-and-a-half after sunset till half-an-hour before sunrise, in the counties of Lancashire, Cheshire, Flint, Stafford, Warwick, Worcester, Shropshire, Hereford, Oxford, Berkshire, Gloucester, Wilts, and Dorset.

Bury St. Edmunds Gas Company.—At the half-yearly meeting of the Company, the usual dividend was declared; but the Directors' report contained an intimation that "the uncertainties of the future might make it necessary to re-adjust the dividend, or re-consider the custom of paying the dividends free of income-tax." The revenue account showed a balance of £1348; and the Chairman (Mr. T. Ridley) said they had on the half-year's working earned the dividend which they proposed to pay.

CONSOLIDATED GAS COMPANY OF NEW YORK.

Working Results for 1915.

On the 24th ult. there was issued a condensed statement of the assets and liabilities of the Company as at Dec. 31, 1915; also some very interesting particulars as to the working results of this huge concern for the twelve months.

ASSETS.

Fixed assets, including land, plant, and equipment	$54,385,149·33
Bonds and stocks of, and advances to, Affiliated Companies and other investments	111,061,246·50
Bonds and mortgages	200,000·00
Cash	2,127,624·99
Accounts receivable	3,492,457·03
Material and supplies	996,081·29
	$172,262,559·14

LIABILITIES.

Capital stock	$99,816,500·00
Convertible debentures	24,846,647·50
Accounts payable and accrued charges	3,676,687·19
Stock and bond premiums	13,951,396·99
Renewal and reserve fund	11,962,590·66
Profit and loss	18,008,736·80
	$172,262,559·14

The figures thus far available respecting the Company's operations for the year indicated that its earnings from its gas business (after deducting the reserve for renewals and contingencies) amounted to $2,376,753·40. For the purpose of determining the earnings, applicable (in accordance with the decision of the United States Supreme Court) to the value of the tangible and intangible property ($80,258,978·54), employed in the Company's gas business, there should be added the net earnings of the Astoria Light, Heat, and Power Company, $1,145,467·11. This made the total net earnings from the Company's gas business for the year 1915, $3,522,220·51—an amount which is equivalent to 4·39 per cent. on the above stated value of the tangible and intangible property employed in the manufacture and distribution of the gas sold by the Company.

Dividends were paid during the year on the Company's capital stock, aggregating 6¾ per cent. (at the rate of 7 per cent. per annum) and amounting to $6,737,613·75. The dividends and interest received on stocks and bonds owned and advances made to affiliated gas and electric companies, operating in the boroughs of Manhattan, Queens, and the Bronx, and also in the County of Westchester (excluding interest and dividends received from the Astoria Light, Heat, and Power Company, the net earnings of that Company being included above) amounted to $6,700,383·08. The interest paid during the year on the funded and other debt amounted to $1,719,745·66. Therefore the surplus (including that of the Astoria Company) to be carried to the profit and loss account for the year 1915 was $1,765,244·18.

Of the total authorized issue of $25,000,000 of convertible debentures of the Consolidated Company, subscriptions were received for $24,850,750. On Nov. 1, $1,236,000 of debenture bonds, 1888 issue (the balance then outstanding), were paid off. On Feb. 9, $2,500,000 of the Company's demand notes, issued in 1906 and 1907, were paid off. On April 25, $2,500,000 of eight months' collateral trust notes were paid off. On June 26, $7,500,000 of similar trust notes were paid off. The gas sales of the Consolidated Company fell off during the year, as compared with 1914, by 829,075,400 cubic feet, or 5·02 per cent. Its gas sales and those of its affiliated Companies in the borough of Manhattan fell off during the year by 1,230,034,900 cubic feet, or 5·38 per cent. In the borough of the Bronx the decrease in gas sales, due to the decrease in the consumption of gas per individual, was nearly off-set by the increase resulting from the development of building operations in the territory; so that the loss in the volume of sales amounted during the year to only 29,803,600 cubic feet, or 0·70 per cent. In Westchester County and in the borough of Queens—both of which are growing territories—the sales of gas increased during the year by 46,508,502 cubic feet, or 1·98 per cent. The combined sales of gas of the Consolidated Company and affiliated Companies in the boroughs of Manhattan, the Bronx, and Queens, and in Westchester County amounted to 1,213,329,998 cubic feet less than in 1914—a loss of 4·12 per cent.

For the purpose of ascertaining the real cause for the abnormal decrease in the consumption of gas in the borough of Manhattan, comparisons have been made between the variations in the amount of gas consumed in 1914 and 1915 in all classes of establishments—including dwellings, apartment houses, stores of various kinds, factories, hotels, and restaurants. These indicate that, except in the case of restaurants (which show an increase in consumption), the percentage of decrease in dwellings and apartments as well as in all classes of business has varied within a comparatively narrow margin between 2·50 and 9·63 per cent. For example, 5000 of the prepayment meter accounts show an average decrease of 3·65 per cent.; while 1000 miscellaneous stores show an average decrease of 6·49 per cent. An average decrease in gas consumption by 500 grocery stores in 1915, as compared with 1914 was 9·63 per cent.

Among the reasons assigned for the result shown are: The effect of the European war upon large and small manufacturing concerns, which are dependent on Europe for their raw material and have in consequence greatly reduced their output—resulting in a decrease in gas consumption; the growing popularity of moving-picture theatres, which operates to decrease the domestic consumption of gas for illuminating purposes; the ever-increasing use of electricity for such purposes as well as the growth of the use of small electric appliances, which supplant the gas-consuming ones heretofore used; the weather conditions during the months of January, February, March, November, and December, 1915, which were not favourable to the normal consumption of gas in these months; the policy of the Department of Water Supply, Gas, and Electricity, which has led to the displacing of a very large number of gas street lamps and the substitution therefor of electric

lights; the practice of greater economy in the use of gas for illumination as well as for domestic purposes; and the growing popularity and use of incandescent gas-mantles, which, compared with the old-time flat-flame burners, combine greater illumination with diminished gas consumption.

During the year the Consolidated Company and its affiliated Companies installed 187,851 appliances, and there were surrendered to the Company 97,455—a net increase of 90,396 in the number of appliances in use, which had been installed by the Companies, as against a net increase the previous year of 61,570 appliances. The net increase in 1915 included 1582 hotel and restaurant appliances, and 3496 industrial appliances. On Dec. 31 the Consolidated Company and its affiliated Companies had under rental contracts 428,983 cooking appliances of various types—an increase of 19,920 over the number installed on Dec. 31, 1914.

Among the purposes for which industrial appliances were installed are included: Japanning automobile bodies; sterilizing milk bottles; lacquering display fixtures; firing china; heating doll-moulds; heating presses; reducing radium ore; supplying heat for the manufacture of paint, and also for the treatment of automobile springs; heating oils for compounding; applying heat to shrapnel shells; supplying steam for corrugating paper; dressing belts; treating with heat certain parts used in the making-up of electrical novelties; manufacture of dies; producing steam for heating acid baths; manufacture of drugs, face creams, soaps, and toilet preparations; supplying steam for cloth-sponging cylinders; the manufacture of millinery supplies; heating various oil baths; manufacture of ladies' hats; wholesale baking of veal-loaves, and also bread; and the smoking and curing of hams and bacon.

Last fall the Company inaugurated another lamp campaign to promote the "C. E. Z." incandescent gas-lamp. This lamp is said to be simple in construction, is equipped with three small mantles of great durability, and is the latest development in the art of incandescent gas lighting. It diffuses a soft, mellow light of high illuminating value. Its merits have evidently been recognized by the public, as over 100,000 have been sold since the campaign started. In the campaign two years ago more than 91,000 incandescent gas-lamps were sold.

The installation of two 72-inch gas-mains in the new Astoria Tunnel between Astoria and the Bronx was finished during the year; and the transmission of gas through these mains began on Oct. 1. Their installation marks the completion of comprehensive plans whereby the gas distributing systems in the boroughs of Manhattan, the Bronx, and Queens are connected in a manner which insures an uninterrupted supply of gas in the three boroughs supplied by the Consolidated Company and its affiliated Companies—thus conserving permanently the safety and convenience of the public.

At the annual meeting of the Yeadon and Guiseley Gas Company, last Wednesday, it was reported that the profits had amounted to £3130. Dividends were declared at the rates of 10¾ and £7 10s. 6d. per cent.

MAXIMUM PRICES FOR SULPHURIC ACID.

A notice was issued last week from the Ministry of Munitions to all sulphuric acid makers and dealers fixing maximum prices for the sale of acid. These came into force yesterday.

The prices per ton for acid delivered into railway trucks, carts, or barges, at makers' works, are as follows:

—	Degrees Twaddel.	£	s.	d.
Class A.—Arsenical acid . .	140	3	0	0
Class B.—Dearsenical acid .	144	3	15	0
Class C.—Arsenical acid . .	168 (93-95 per cent. H_2SO_4)	5	15	0
Dearsenical acid .	168 (93-95 per cent. H_2SO_4)	6	0	0

Incidental charges are also to be regulated as under:

When the acid maker supplies the tank-trucks, he shall be entitled to make a further charge of not more than 5s. per ton for filling and hire of tank-trucks.

When the acid maker supplies the acid in his own drums, he shall be entitled to make a further charge of not more than 10s. per ton for filling and hire of drums.

When the acid is supplied in the acid makers' own carboys, he shall be entitled to make a further charge of £1 per ton for filling and hire of carboys. When carboys are supplied by the purchaser, it is recommended that a charge of 10s. per ton should be made by the acid maker to cover the cost of filling.

THE EXPLOSION AT A BLACKBURN GAS-WORKS.

Result of the "Investigation" by the Trades' Council.

Further reference was made to the recent explosion at the Addison Street Gas-Works of the Blackburn Corporation at a meeting of the Trades' Council last Wednesday, when a report was presented by a Sub-Committee as to the cause of the explosion. At both the January and February meetings of the Town Council, Mr. E. Porter, the representative of the Gas-Workers' Union, sought to have an inquiry made into the cause of the explosion [see *ante*, pp. 100, 322]; but this has not been agreed to.

The Trades' Council report alleges that at a meeting of the Blackburn Gas Committee on Dec. 20 [four days after the explosion] the Mayor (Alderman Nuttall, J.P., who is also Chairman of the Gas Committee), in the presence of Mr. J. Johnson, J.P., and Mr. E. Porter, stated that he (the Mayor) with Mr. A. Morton Fyffe, M.Inst.C.E. (the Gas Engineer), had made inquiries, and were satisfied

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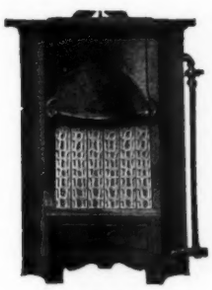

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WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

that the explosion had been deliberately caused by workmen acting in collusion with some one outside the works. The Committee of Investigation emphatically declare, after a full inquiry, that—

1.—The explosion was not deliberately caused.
2.—There was not a particle of truth in the statement that a valve had been tied down with a rope.
3.—If one valve had been so tied down, as alleged, there being six valves in all, an explosion could not possibly have happened from this cause.
4.—The explosion was due to incompetency.

The report goes on to say the Sub-Committee consider that for the Mayor to make such a charge against the workmen of the character reported, and then to oppose an inquiry, was un-English. In common fairness, they must again press upon the Town Council their demand for the appointment of a public tribunal to go into the whole matter, so that the stain upon the honour of the employees of the ratepayers of Blackburn can either be removed or they can be proved guilty of the offence, and dealt with in a proper manner.

Mr. J. Frankland, J.P., who presented the report, said the Committee, in dealing with the matter, had endeavoured to get at the real facts; and the men they consulted were prepared to go before any Court or tribunal and stand their trial.

The meeting decided to ask the affiliated societies to the Trades' Council to appeal to the Town Council to appoint a tribunal for investigation.

A "Bad Gas" Resistance League.—At a public meeting held at Brentwood (Essex) some days ago, a "Bad Gas" Resistance League was formed, the members of which pledged themselves not to pay their latest gas bills till these had been reduced to the same amount as last year. The assertion was made that "analysis had proved the gas to be largely composed of atmospheric air;" and on the Ministry of Munitions being communicated with, they had replied that "in no case had they advised gas companies to add air to their gas to make up the profits."

Derby Gas Consumption.—The 96th annual report of the Directors records that, notwithstanding an increase in price as from June last, and the restricted public lighting and hours of business, there has been a greater consumption of gas locally. For general use 1,071,778,400 cubic feet, and for public lighting 26,999,700 cubic feet, were sold, as compared with 1,038,210,600 feet and 42,501,000 feet in 1914. The total receipts were £114,810, against £104,575; but the cost of manufacture was £122,288, compared with £95,786 in the preceding period. The balance of revenue carried to profit and loss account is £34,498, against £33,158. An interim dividend of 5 per cent. per annum having been paid for the first half year, the Directors recommend payment of the standard rate of 5 per cent. per annum on the consolidated stock for the second half year, with an additional ¾ per cent. for the whole year, making 5¾ per cent., less income-tax.

GERMAN GAS-MANTLES.

Government Supply to Labour Exchange.

[From the "Daily Mail," Feb. 10.]

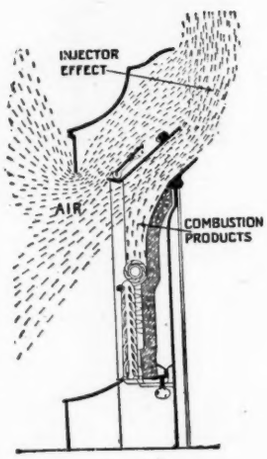
An enterprising clerk in a provincial Labour Exchange made a curious discovery the other day. The Office of Works in London forwarded a fresh supply of incandescent gas-mantles for use at the exchange.

The small carton enclosing each mantle was to the outward eye a plain cardboard cylinder, with an outer covering of pink paper. The brand of the mantle was not proclaimed. The carton bore no print whatever. The clerk, being suspicious, soaked the carton in water. The pink paper peeled off, and in one case revealed the following:

The wording means "Gas-Mantle Factory, Diana Works." Another bore the title "Tiger Mantle," and underneath "Made in Germany."

The specimens were shown yesterday to the Office of Works by a representative of the "Daily Mail." An official replied that the Department had a perfect explanation of the incident; but it could not be communicated for publication.

WHAT "THE LANCET" (JAN. 15, 1916) SAYS OF WRIGHT'S "INJECTOR-VENTILATING" GAS-FIRES



"In the earlier days of the gas-fire the system fell into disrepute on three counts: first, the combustion products did not entirely escape up the flue, but vitiated the air of the room to some extent; secondly, even when that was not the case there was no efficient ventilation of the room as there is with the open coal fire; and thirdly, the flames were irritatingly noisy. Until quite recently we have not examined a gas-fire which quite satisfied us on all three points. Messrs. John Wright and Co., of Essex Works, Birmingham, have introduced an 'injector-ventilating' gas-fire which shows that these essentials have received considerable attention, and the result is a very important gain to this system of heating by radiant gas-fires. This fire not only secures the complete withdrawal of the products of combustion, but by means of a second opening a powerful in-draught of air from the room is induced to flow up the chimney. This ventilates the room as effectively as the open coal fire, and a true atmospheric flame is secured which is constant in its character and unaffected by variations of pressure; above all it is silent. It is surprising to see a clean blue intense flame free from purring sound. This has been effected by bringing about a thorough mixing of air and gas by means of a perforated thimble dropped into the opening of the burner. This is provided with vertical perforations, and in ordinary practice it cannot be choked with grit. The purring is probably due to a rapid series of minute explosions resulting from an imperfect mixture of gas and air. At the same time there is an ingenious fitting which provides for initial pressure adjustment. Altogether, this fire marks a most important advance, and is calculated to remove what prejudices remain against the use of gas for the purpose of domestic heating."

JOHN WRIGHT & CO., ESSEX WORKS, BIRMINGHAM.

DUBLIN ELECTRICITY UNDERTAKINGS.

Commenting upon what it describes as the "Dublin Electricity Muddle," the "Irish Independent" alludes to the eight counts in Mr. P. W. D'Alton's report, as expert investigator under a Special Committee of the Corporation. The counts are: Administration unduly complicated, charges for private supply unduly high, wages in respect of public lighting out of proportion to the gross revenue attributed to the service, high cost of secretarial department, system of coal supply as a monopoly, unreliable returns of units generated, use of obsolete engines, ineffective condensers. Mr. D'Alton's observations reveal, the "Independent" thinks, "woful and unreasonable mismanagement and incompetence;" and it holds that, had the undertaking at the inception been handled in a business-like way and conducted by men of normal commercial ability, many of the charges for which loans have been made could have been defrayed out of revenue.

With reference to a reply to Mr. D'Alton's report, by Mr. F. Allan (the Secretary of the Electricity Committee), expressing unbounded faith in the future of the undertaking, the "Independent" states that in 1911 he calculated on the retention of an additional 10 per cent. charge to consumers for four years more, and estimated a net profit of £20,000 for 1915, whereas the profit was only £748. "On the current year, the Committee estimated a deficit of £21,334; and in order to wipe this out, the charges for both power and light were increased, and, in addition, consumers have still to bear the 10 per cent." Complaint is made that "no fewer than five more or less independent departments have been set up in connection with the lighting of Dublin." As to Mr. Allan's contention that the Corporation had "a broad duty to the ratepayers generally, as well as a narrow one to that section of the ratepayers which uses electricity," the "Independent" charges that the Corporation "have mulcted both alike—first, by charging for electricity a higher price than is paid in any other large city in the United Kingdom, and, secondly, by making the ratepayers liable for deficits due to municipal blunders."

In a later comment, the "Independent" points out that the Dublin Tramways Company produce nearly 4 million more units than the Corporation; but the total coal bill of the Company for 1915 was only £20,596, as compared with an estimated cost of £39,605 for the municipal electricity undertaking. The gross income from lighting by the Corporation is only £105,440; while that of the Tramway Company is £333,899. "The surplus on the lighting, after payment of all charges, is negligible; so that the ratepayers, as such, receive no benefit from the undertaking. On the whole, it has been subsidized by the rates to the extent of over £46,000."

East Cowes Gas Company.—The East Cowes Gas Company had an increased output of 22 per cent. (over 6 million cubic feet) for last year. The working is reported to have been excellent. The gas sold per ton of coal carbonized averaged 11,735 cubic feet.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 14.

A certain amount of business continues to be done in pitch, but the market generally is quiet. The price remains unaltered at 19s. to 19s. 6d. per ton net, in bulk, at makers' works. There is an increased demand for tar for road work. In other products there is nothing of special interest to record.

The export price of sulphate of ammonia remains unchanged at £17 5s. per ton net, into buyers' bags, at makers' works, for 25 per cent. quality, and the position is firm. The home demand continues good.

Tar Products in the Provinces.

Feb. 14.

The prices for tar products remain about the same. There is nothing of importance to report concerning pitch. Creosote is quiet, with very little business doing. Solvent and heavy naphthas are still in good demand.

The average values of gas-works products during the past week were: Gas-works coal tar, 18s. 3d. to 22s. 3d. Pitch, East Coast, 15s. to 16s. per ton; West Coast, 14s. to 14s. 6d. Manchester; 15s. to 15s. 6d. Liverpool; 17s. to 17s. 6d. Clyde. Benzol, 90 per cent., North, 10¼d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 7d. Solvent naphtha, naked, North, 2s. 1d. to 2s. 2d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2⅝d. to 2¾d. Heavy oils, in bulk, 3⅝d. to 4d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene, £18 to £28; salts, 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Feb.* 12.

During the past week there has been little disposition on the part of consumers and distributors in this country to make further purchases of this material, and, as new export trade is prohibited at present, with the exception of British possessions, values have declined still further. The closing quotations are £16 17s. 6d. per ton f.o.b. Hull, £17 f.o.b. Liverpool, and £17 5s. f.o.b. Leith. The market for future delivery is now only a narrow one, and no first-hand transactions have been reported; but it has transpired that sales have been made by dealers at a small premium on prompt prices for shipment from May to December.

Nitrate of Soda.

This market is firmer again, and holders on spot now require 16s. 9d. per cwt. for ordinary quality, and 17s. 6d. for refined.

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Established in the Reign of George II.

Sulphate of Ammonia.

From another source, it is stated that there has been practically no difference in the prices throughout the past week. Outside London, makes are quoted at £16 12s. 6d.; Hull, £17 5s.; Liverpool, £17 7s. 6d.; Leith, £17 7s. 6d. to £17 10s.; Middlesbrough, £17 7s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is active; but large quantities of coal are being taken up by the Admiralty, and this restricts in some measure the general shipments and the forward business. In the steam coal trade, the pressure of the special demand seems to be most felt, and prices are high but nominal. Best Northumbrian steams are as much as 32s. 6d. per ton f.o.b.; second-class steams are about 27s. 6d. to 29s. per ton, and are very firm; and for steam smalls, the quotations vary from 14s. to 17s., according to the class. Production is fairly good when the limited number of miners is called to mind. In the gas coal trade, the long contracts take up a large part of the output, and the amount left finds ready sale, with stiff prices. Best Durham gas coals are very firm at 25s. to 25s. 6d. per ton f.o.b.; second-class gas coals are about 24s. 6d. per ton; and "Wear Specials" are from 26s. per ton f.o.b. There is a strong demand for other classes of Durham coals; so that gas coals are in some measure affected, and they are kept scarce. The rate of freights is a little easier, owing to the fewness of the loading turns available; but gas coal from the Tyne to London has still to bear a freight of about 14s. 6d., unless there are contracts to prevent the current freight applying. There are few contracts now in treaty—high prices and freights rendering buyers cautious. In the coke market, the demand for coke for shipment is full, and prices are well maintained. Gas coke, however, seems fairly plentiful, and good makes are from 26s. to 27s. 6d. per ton f.o.b. in the Tyne.

Cleveland Water Company.—At the 95th half-yearly meeting of the Company, which was held at Saltburn last Wednesday, Colonel W. H. A. Wharton, who presided, referred to the loss the Company had sustained by the death of Mr. W. I'Anson, who had acted as Engineer and Secretary since the inception of the Company 46 years ago, and under whose supervision the whole of the works were constructed. The financial statement showed a balance of £5033 on the working; and the Directors recommended that £3400 should be used in the payment of dividends of 10 per cent. per annum on the "A" shares and 7 per cent. on the "B" shares, and that £1633 should be carried forward. It was reported that Mr. W. M. I'Anson (son of the late Engineer), who had acted as Assistant for 22 years, had been appointed to the position of Engineer, and that Mr. W. J. Deighton, who has been in the Company's service for 40 years, had been made Secretary. The action of the Directors was approved.

Walker and Wallsend Union Gas Company.

The annual meeting of the Company was presided over by the Chairman (Mr. C. J. Potter), who stated that the gas sales showed an increase of 1·11 per cent. over the previous year, and were the highest that had been obtained in any one year. In the second half of the year, however, there was a falling off, due entirely to the lighting restrictions. The balance on the revenue account was £12,579, which was within a few pounds of the previous year. The Directors were recommending the full statutory dividends, and a further £500 to the insurance fund, which left a balance of surplus profits of £1105 to be carried to net revenue. All local gas undertakings, and nearly all in the kingdom, had had during the past year to raise the price of gas. In deciding to increase the charge 2d. per 1000 cubic feet, the Directors were influenced by the evident increased prices of coals, materials, and other extra charges during the present year. Under the Company's Act and the operation of the sliding-scale, the dividends on the ordinary stocks would be reduced 5s. per cent.; but he trusted this would not be of long duration. The report was adopted.

Hindley Gas-Workers' Wages Advanced.—At the last meeting of the Hindley (Lancs) District Council, it was reported by Mr. H. O. Timmins (the Gas Manager) that an application had been received through the Gas-Workers' Union for an increase of stokers' wages from 5s. 6d. to 6s. per day. The Council decided to grant the advance asked for as from the 3rd ult. It was further agreed that labourers in the department should be paid at the rate of 6d. per hour.

Middlesbrough Coke-Oven Gas Supply.—The Middlesbrough Gas Committee have had under consideration a letter from the Ministry of Munitions, asking the Corporation to accept a modification of Messrs. Samuelson and Co.'s contract for the supply of gas, involving the extraction from it by them of the greater part of the benzol, of which, it is calculated that 14,000 gallons is contained in a month's supply. The firm reported that it would be at least two months before the stills were ready to debenzolize the gas. The matter was left with the Chairman, the Town Clerk, and the Gas Manager (Mr. David Terrace), with plenary powers.

Sleaford Gas Company.—It was announced by the Directors in their report on the past year's working that, owing to the very large increase in the cost of coal, the price of gas had had to be raised from 2s. 10d. to 3s. per 1000 cubic feet. It was added that the sum of £406 had been expended in the erection of plant for the recovery of toluol, at the request of the Government; and this had been charged to revenue account. There had been a diminution in the consumption of gas, due to the lighting regulations made by the military authorities. At Dec. 31, there were 1463 meters in use (824 prepayment, and 639 ordinary). The report, which was submitted to the shareholders last Thursday, recommended a dividend at the rate of 10 per cent. per annum, free of income-tax.

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Coke for Bath-Boilers.

Having regard to the price of coal, says the "Municipal Journal," the Baths and Washhouses Committee of the Deptford Borough Council recently authorized an experiment to be made for using coke with the coal in the furnaces of the boilers at Laurie Grove baths; but it was found impracticable. The Gas Company then offered to instal free of charge in one of the boilers a steam-jet apparatus, with a view to coke being used exclusively as fuel, for a period of four weeks, on the understanding that if the test results in effecting the economy claimed for it the Council will purchase the apparatus at a cost of £12 12s. The Company agree to remove the apparatus free of charge to the Council, if it is proved unsatisfactory at the end of the trial. It is estimated that the provision of the apparatus will save £5 10s. 6d. in the cost of the baths fuel consumption per week. The apparatus has been fitted to steam-boilers at several London factories; and favourable reports have been received as to the results at these places. The Committee have given directions for the apparatus to be fixed in accordance with the above arrangement.

Price of Gas at Tandragee.—The Tandragee (co. Armagh) Urban Council have rejected a proposal to discontinue giving 5 per cent. discount to gas consumers whose yearly accounts amount to £5 and upwards. They have, however, decided to consider the advisability of increasing the price of gas after the close of the financial year.

Dorchester Gas Company.—The Directors submitted a report at the half-yearly meeting of the Company last Tuesday, in which they stated that there had been a decrease in the consumption of gas, as compared with the corresponding period; the chief causes being the complete absence of cold weather and the restricted lighting of both public and private lamps. The Board regretted having to recommend (in view of the increased cost of all materials required, including coals and labour, and the heavy cost of renewals at the works) that a dividend of 6 per cent. be declared on the ordinary and 6 per cent. on the preference shares, both less income-tax.

Melton Mowbray Gas Company.—Owing to the great advance in price of coal, and the reduction in consumption of gas during the past six months, the Directors are not able to distribute their usual interim dividend, but are paying 2s. per share less—income-tax paid as usual. There is now no public lighting, and the prospect of keeping up the consumption of gas seems very doubtful. A motor lorry for the carting of coal and delivery of coke has been purchased, and is giving every satisfaction. During the past six months, a new boiler has been fixed; and this has been charged to the revenue account. The Company have also during the half year been to the Board of Trade for new powers, which it is hoped may in time to come prove beneficial to the undertaking. The price of gas has been slightly increased. Though coke has realized much more than usual, tar and liquor have not furnished such good results.

Signalling the Approach of Hostile Aircraft.

As an instance of the arrangements which are being made over the country, it may be stated that intimation was last week made by the Head Constable of Liverpool that the authorities had now come to practically the same arrangements with the Liverpool Gas Company as they had done with the Electric Supply Department as to the course to be taken in case of an air raid in the vicinity. The warning to the public will consist of gradual diminution; and this will be commenced as soon as the signal agreed upon has been passed to the gas authorities. The reduction will be immediately observed; and this will affect all gas-lights in use, whether in private houses or in the streets. The lighting will gradually go on diminishing, until it arrives at about a quarter of what it would be at full pressure. The diminution will be quite patent to private consumers of gas, and to persons in the streets or elsewhere, and will be effective in about ten or twelve minutes. It will be taken as a warning that official intimation has been received of the presence of hostile aircraft somewhere. When the gas is lowered, consumers will see to the cocks or taps being properly turned off; and they are advised to turn the gas off at the meter. Care must be taken to see that when the gas comes on again, it does not find the taps open, and so be a possible source of danger.

Coatbridge Gas Company.—At the recent annual meeting of the Company, dividends under the sliding-scale on the various classes of shares were declared; and at a subsequent extraordinary meeting, authority was given by the shareholders to the Board to raise additional capital to meet proposed expenditure on the introduction of modern carbonizing plant.

Labour Unrest in South Wales.—A South Wales correspondent writes that the dispute which has arisen among the gas-workers in some of the coal districts of South Wales, with reference to the question of wages, has spread to the Merthyr Gas-Works, where, he understands, that notices were last week-end tendered to terminate contracts. The gas-workers' official representative interviewed the Company's Manager (Mr. J. E. Kenshole); and, as a result, the men are stated to have been offered rather better terms than some of those accepted in other places. It was reported, however, that the terms had been rejected.

Edinburgh Corporation and Automatic Gas Lighting.—A Sub-Committee of the Edinburgh Town Council last Tuesday visited Messrs. Alder and Mackay's works, with a view to seeing in operation the firm's pressure-wave automatic system of lighting and extinguishing gas-lamps, as applicable to the public lamps of the city. It is understood the members of the Sub-Committee were favourably impressed with what they saw, and with the possibilities of the system, and agreed to recommend the full Committee to agree to an experimental installation of the system being fitted up as quickly as arrangements can be made in two districts of the city. The Lord Provost (Sir Robert K. Inches) accompanied the deputation. Gorgie will probably be one of the districts,

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Cheaper Gas at Barnoldswick.—As a result of the excellent working of the new plant at the Barnoldswick Gas-Works, the Gas Committee have decided to grant an additional discount of 3d. per 1000 cubic feet on all gas accounts for the present and ensuing quarter, thus reducing the net price for ordinary consumers from 2s. 9d. to 2s. 6d., and for power purposes from 2s. 7d. to 2s. 4d. per 1000 cubic feet. The present price of 13s. 4d. per ton for coke at the gas-works is considerably below that of neighbouring authorities. This, however, is only to local ratepayers; outsiders being charged at the rate of 16s. per ton. Last year the profits from the gas undertaking relieved the rates to the extent of 4d. in the pound. The Council and the Manager (Mr. J. W. Thompson) must be gratified at the position of affairs.

Malton Gas Company.—The Malton (Yorks.) Gas Company's half-yearly report states that the trading has been most unfavourably affected by the war. The general result is that the profit has fallen considerably below the average, notwithstanding the increased price of gas. The amount available for division is £2878 (including £824 balance of revenue account, and £1909 brought forward); and the Directors recommend the payment of a dividend of 5 per cent. for the half year, free of income-tax. Thus will £1200 be absorbed; and, deducting the mortgage and other interest, there will be £1596 to carry forward. The dividend is a reduction of 1 per cent. upon former figures for the half year. At the meeting, Mr. W. H. Pearson, who presided, said that for the first time for a great number of years they had been unable to earn the amount necessary for the payment of dividends. Hitherto they had paid 6 per cent. for the half year, which absorbed £1440. Last half year they only earned £887, and the Directors recommended a reduced dividend of 5 per cent. This was approved.

Whitby Gas Company.—In their report for the year ended Dec. 31 last, the Directors state that the profit and loss (or net revenue account), after charging it with interest on debenture stock, interest on deposits, and bank interest, and after providing for the interim dividend, shows a balance of £1158, out of which the Directors recommend the payment of dividends at the rate of 3 per cent., less income-tax, on the original capital, and of £2 2s. per cent., less income-tax, on the additional and new additional capital for the past half year, making, with the interim dividends, 6 per cent. on the original capital, and £4 4s. per cent. on the additional and new additional capital for the year. This will absorb £918, and leave a balance of £240 to carry forward. The Directors regret to state that the sale of gas decreased by 14 per cent. compared with the previous twelve months. This is entirely due to the abnormal conditions prevailing, and, taking into consideration the lighting restrictions, and the absence of visitors during the season, is less than might have been expected. During the year the Company have, at the request of the Ministry of Munitions, been extracting certain constituents from the gas required to increase the supply of high explosives. This process, while of no financial gain to the Company, is of vital necessity to the cause of the Allies. Several of the Company's employees are serving with His Majesty's Forces, and allowances amounting to £104 have been paid to their dependants.

Bradford Gas Poisoning Case.—An inquest was held last week, at Bradford, on the body of Harold Rowan, the child of a soldier on service, who died from gas poisoning [reported in the "JOURNAL" last week, p. 328], and upon Peter Lester, a child in the next house who was ill, but whose death was regarded as being due to the escape of gas. Mrs. Rowan and her other children had recovered from the effects of the gas sufficiently to give evidence. Other evidence was that the smell of gas had been noticed around the house for a week or two; but it had apparently not been reported to the authorities. Mr. Charles Roper, the Distributing Superintendent to the Bradford Corporation Gas Committee, said the first report from the street was received about 6 o'clock on Friday morning—the morning of the discovery of the affected people; and he was personally present later when the main in Crown Street was uncovered. There was a crack in the pipe not extending entirely round it. The pipe was laid before 1885, though he could not say how long before. The life of a gas-pipe was very long, and might be sixty years. The pipe was about 2 ft. 6 in. from the surface, and 4 or 5 feet from the houses. When there was was an escape it was possible for it to percolate through the soil. There were no trams or telegraph poles in the street which might have interfered with the pipe. Dr. Shackleton said that death in both cases was due to asphyxia caused by coal gas. The Coroner, in summing up, said it might have been the case that there has been a certain amount of flaw in the pipe; and the "bang" which occurred might have been caused when the pipe gave through the pressure becoming too strong for it. The Jury could take it there had been no negligence. The first report to the authorities seemed to have been at 6 o'clock in the morning, and the pipe was being repaired shortly afterwards. He did not see that any criminal responsibility could be put upon any person or persons whatever. The Jury returned a verdict of "Accidental death" in each case.

The Darlington Corporation General Purposes Committee decided last Thursday to recommend that in regard to gas-works employees the war bonus scale should be amended to provide an increased payment of 1s. per week to each employee. This will mean an additional expenditure of £343 per annum.

In response to a resolution of the Bradford City Council calling for more light, the Chief Constable has replied that, in accordance with the powers vested in him under the Home Office Lighting Order, he had authorized the lighting of public lamps at the junction of streets and roads and other places. He had prohibited the lighting of private lamps, and of public lamps in the side streets. The whole matter of lighting had been taken into review, and special claims to lighting where there were steps or posts had been acceded to. Public lighting had been increased by 55 per cent., and this was the utmost he could do, having regard to the order that public safety be provided for. Since the new order was put into force, accidents after sunset had decreased by 45 per cent., as compared with the same period under the order as it was previously.

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APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Feb. 9.]

Nos. 1437—1769.

BELLAMY, A. R.—"Suction-gas generators." No. 1576.
BRADSHAW, G. D.—"Gas-burners." No. 1659.
COLE, H. E. C.—"Automatic gas-saving control." No. 1670.
DEMPSTER AND SONS, R.—"Feeding-shoots for delivering coal, &c., to conveyors." No. 1624.
HUMPHREY, H. A.—"Valves." No. 1465.
JAMES, C.—See Bellamy. No. 1576.
MORRIS, J. M.—"Gas-generators." No. 1604.
RUSDELL, W. J.—See Humphrey. No. 1465.
SMITH, G.—"Compound suitable for heating or gas-producing purposes." No. 1732.
SOUTHGATE, A. W.—"Gas-regulators." No. 1736.
TOOGOOD, H. J.—See Dempster and Sons, R. No. 1624.
TREDEGARS LIMITED.—See Morris. No. 1604.

A fire in the store-rooms at the Lower Gornal Works of Messrs. Gibbons Bros. last Wednesday resulted in the partial destruction of this part of the building, and considerable damage to the stock. The fire brigade were successful in confining the conflagration to the one portion of the premises.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

The public are informed that newspapers and other printed publications will not be sent to Neutral European Countries unless posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral European Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

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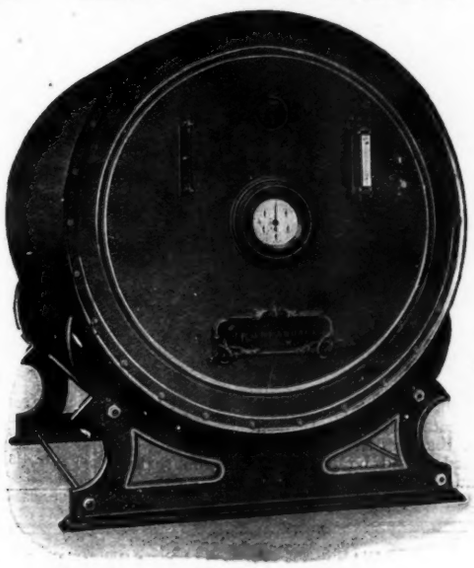

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The Chairmen and Vice-Chairmen of the various Committees of the Rotherham Town Council have been requested to take into consideration the question of horse-hire, and to report as to the advisability of making arrangements by which the carting work of the Corporation might be done by means of motor traction. The proposal is through the demands of the carting contractors. The Gas Committee are of opinion that, with light motor lorries carrying up to 2 tons, the work would be done more cheaply than by horse haulage.

STOCK MARKET REPORT.

THE Stock Exchange has had a better week. One gratifying feature was the substantial increase in business; and if regard be had to the amount of money going into Treasury Bills and Exchequer Bonds—a fair portion of which would in all probability have come into Capel Court—this means a good deal. Then a tone of cheerfulness characterized markets in general with but few exceptions; and some of them displayed quite remarkable strength. The gilt-edged division were firm as a rule, though the War Loan was not at its best at the close. Choice Colonial issues were in steady demand. Home Rails ought to have been enlivened by the good dividend announcements of two important lines, but somehow or other they failed to respond. Americans were better to a moderate degree; but Canadians emancipated themselves from the thrall, and made a fine advance. The Foreign Market generally was firm; the French loan, and especially Japanese, being most conspicuous in the upward movement. *Per contra*, German 3 per cents were sold down to a 6½ per cent. price for money. Argentines were irregular, advances being followed by realizations; while South Africans were much the same. The greatest animation was displayed in the Miscellaneous group, where rubber, oil, and metals had quite a fine time. Among topics of interest was the announcement of a French Government scheme to open the Stock Exchange for the negotiation of stocks belonging to French owners through the Bank of France and the Bank of England. Inside the House further action is being taken to press for the removal of the minimum prices which still remain operative. The Committee will probably be desired to consider further the question of more Saturday holidays. Business in the Gas Market was quieter still, hardly anything being touched except Gas Light and Coke. The tendency was firm, to which the proceedings at the meetings of some important companies, and the accounts issued by others, contributed. The Money Market was harder.

Bargains done for cash during the week were as follows: On Monday, Bombay 5 1/16, Commercial debenture 57, Gas Light ordinary 78, 78¼, South Metropolitan 77½, ditto debenture 60¾. On Tuesday, Bombay 4⅛, Gas Light ordinary 77¼, 78, 78¼, 78⅜, 78½, ditto preference 76½, Imperial Continental debenture 66½, 67, South Metropolitan 77, 77½, 78, ditto debenture 60¾, 61. On Wednesday, Commercial debenture 57, Gas Light ordinary 77½, 77⅝, 78, 78½, ditto maximum 61, Monte Video 8⅜. On Thursday, Bombay 5, Commercial debenture 56¾, 57, Gas Light ordinary 75¾, 76¼, 77¼, 77⅜, ditto preference 74, Newcastle 80. On Friday, Commercial 3½ per cent. 73⅞, 74⅛, Gas Light ordinary 75⅜, 75½, 75⅝, 76, 78, ditto maximum 60¾, 61, ditto debenture 60⅞, 61, 61¼. On Saturday, Gas Light ordinary 76.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

At an inquest at Middlesbrough recently, on an elderly man who had "gassed" himself by throwing a coat over his head and placing a gas-ring near his face, the Coroner asked the doctor how long it would take a man to suffocate under such circumstances. The reply was that, with the coat over his head, deceased would be insensible in about three minutes. "Asphyxiation" was the verdict.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Shares.	When ex-Dividend.	Previous Div or Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.				£ s. d.	
1,551,868	Stk.	April 8	2½	5⅓	Alliance & Dublin Ord.	59—64	3 18 2	..
874,000	,,	July 10	4	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7⅛	3/-	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	4⅞—5 1/16
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water: 10 p.c.	29—30	5 6 8	..
378,480	10	,,	7	7/-	Bournemouth Gas and Water: B 7 p.c.	15—15½	4 10 4	..
95,000	10	,,	6	6/-	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	4 5 9	..
147,240	—	—	—	4	Bournemouth Gas and Water: Deb.	..	—	..
932,045	Stk.	Feb. 26	†14	†6/-	Brentford Consolidated	261—266	5 5 3	..
734,920	,,	,,	†11	55/-	Do. New . . .	204—209	5 5 3	..
55,000	,,	,,	5	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
221,400	,,	June 11	4	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	10⅔	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	,,	,,	8	7⅔	Do. A Ord. Stk. .	154—159	5 0 8	..
530,000	20	Mar. 26	12½	22/6	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	4/6	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	5 1 2	..
560,000	,,	,,	5⅛	46/8	Do. 3½ p.c. do. .	103—105	5 1 6	73⅞—74⅛
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	56⅜—57
800 000	Stk.	,,	4	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
278,400	—	—	—	11½	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	,,	—	4	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	10/-	European, Ltd. . . .	17½—18	5 11 1	..
16,327,185	Stk.	Feb. 12	4/17/4	42/-	Gas Light and Coke: 4 p.c. Ord. . .	98—102	4 15 6	75⅜—78½
2,600,000	,,	,,	3½	3½	Gas Light and Coke: 3½ p.c. max.	76—79	4 8 7	60⅜—61
4,062,235	,,	,,	4	4	Gas Light and Coke: 4 p.c. Con. Pref.	96—99	4 0 10	74—76½
4,674,850	,,	June 11	3	3	Gas Light and Coke: 3 p.c. Con. Deb.	72½—74½	4 0 6	60⅞—61½
130,000	,,	,,	10	10	Gas Light and Coke: 10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	4½	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	6	Hongkong & China, Ltd.	16½—16⅝	6 11 4	..
86,600	—	—	—	9½	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7½	7½	Ilford A and C . . .	151—154	5 2 4	..
65,780	,,	,,	6⅝	6⅝	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	4½	Imperial Continental .	150—160	5 12 6	..
1,235,000	Stk.	Feb. 12	8½	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	66½—67
200,242	Stk.	Mar. 12	6½	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 6	..
561,000	Stk.	Feb. 26	10	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
718,100	,,	,,	7		Liverpool 5 p.c. Ord. B	146—148	4 14 7	..
306,083	,,	June 26	4	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	6/-	Monte Video, Ltd. . .	11½—12	6 13 4	83
1,875,892	Stk.	July 29	4½	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	80
529,705	Stk.	June 26	3½	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	7/8/8	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	8	Oriental, Ltd. . . .	117—122	6 11 2	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd. . . .	7½—7⅞	6 9 0	..
60,000	50	Feb. 26	13	65/-	Portsea, Island B . .	128—131	4 19 8	..
100,000	50	,,	12	60/-	Do. C . .	118—121	4 19 2	..
52,000	50	,,	10	—	Do. D . .	..	—	..
249,980	5	April 29	8	—	Primitiva Ord. . . .	5½—6	6 13 4	..
499,960	5	June 26	5	2/6	,, 5 p.c. Pref. .	4⅞—5	5 0 0	..
521,600	100	June 2	4	4	,, 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	4	,, ,, ,, 1911	..	—	..
346,198	Stk.	June 26	4	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	6/-	San Paulo: 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5	San Paulo: 5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	10	Sheffield A	223—224	4 9 8	..
209,984	,,	,,	10	10	Do. B	222—224	4 9 8	..
523,500	,,	,,	10	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	6/-	South African . . .	10½—11½	7 16 6	..
6,602,895	Stk.	Feb. 12	5/4/0	44/-	South Met., 4 p.c. Ord.	111—113	4 16 8	77—78
1,895,445	,,	July 10	3	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	60½—61
209,830	Stk.	Feb. 26	8½	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	5 8 5	..
60,000	,,	,,	5	5	Do. 5 p.c. Pref. .	110—112	4 9 8	..
135,000	—	—	—	48/4	Do. West Kent. .	..	—	..
187,558	,,	June 26	5	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½	7½	Tottenham District: A 5 p.c. .	135—138	5 8 8	..
782,275	,,	,,	6	6	Tottenham District: B 3½ p.c. .	115—117	5 2 7	..
181,255	,,	June 26	4	4	Tottenham District: 4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	5	Do. 5 p.c. Deb. Red.	93—95	5 5 8	..
236,476	Stk.	Mar. 12	5	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
80,000	Stk.	Feb. 26	8⅜	78/9	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅞	63/9	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/8	55/1½	,, C 3½ p.c.	110—115	5 2 0	..
352,000	,,	,,	6½	57/6	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	,,	,,	6⅔	63/9	Epsom 5 p.c. . . .	131—136	5 5 2	..
88,416	,,	June 26	3	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

† Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

WORKS ENGINEER AND MANAGER. Cannock, &c., Gas Company. Applications by Feb. 28.
WORKS SUPERINTENDENT. South Shields Gas Company.
SULPHATE MAKER. No. 6155.

Appointments Wanted.

REPRESENTATIVE. No. 6152.

Plant, &c. (Second Hand), for Sale.

GAS-METERS. Royal Mint.
SCRUBBER. No. 6154.

Meetings.

BRIGHTON AND HOVE GAS COMPANY. No. 5, Great Winchester Street, E.C. March 3. Two o'clock.

HARROW AND STANMORE GAS COMPANY. Westminster Palace Hotel. March 6. 12.30 o'clock.

NORTH MIDDLESEX GAS COMPANY. No. 5, Great Winchester Street, E.C. Feb. 23. 2.30 o'clock.

RIDDINGS GAS COMPANY. No. 139, Cannon Street, E.C. Feb. 29. Twelve o'clock.

SOUTHGATE GAS COMPANY. No. 5, Great Winchester Street, E.C. March 2. 3.45 o'clock.

TENDERS FOR

Coal.

LIMERICK GAS DEPARTMENT. Tenders by Feb. 21.

Tar and Liquor.

HAWORTH URBAN DISTRICT COUNCIL. Tenders by Feb. 26.

H. MITCHELL, FOR PATENT SLOT METER PAD & OTHER LOCKS. R. & J. DEMPSTER, LTD. 64 & 2396 Manchester. KENTISH TOWN, N.W. Telephone No.